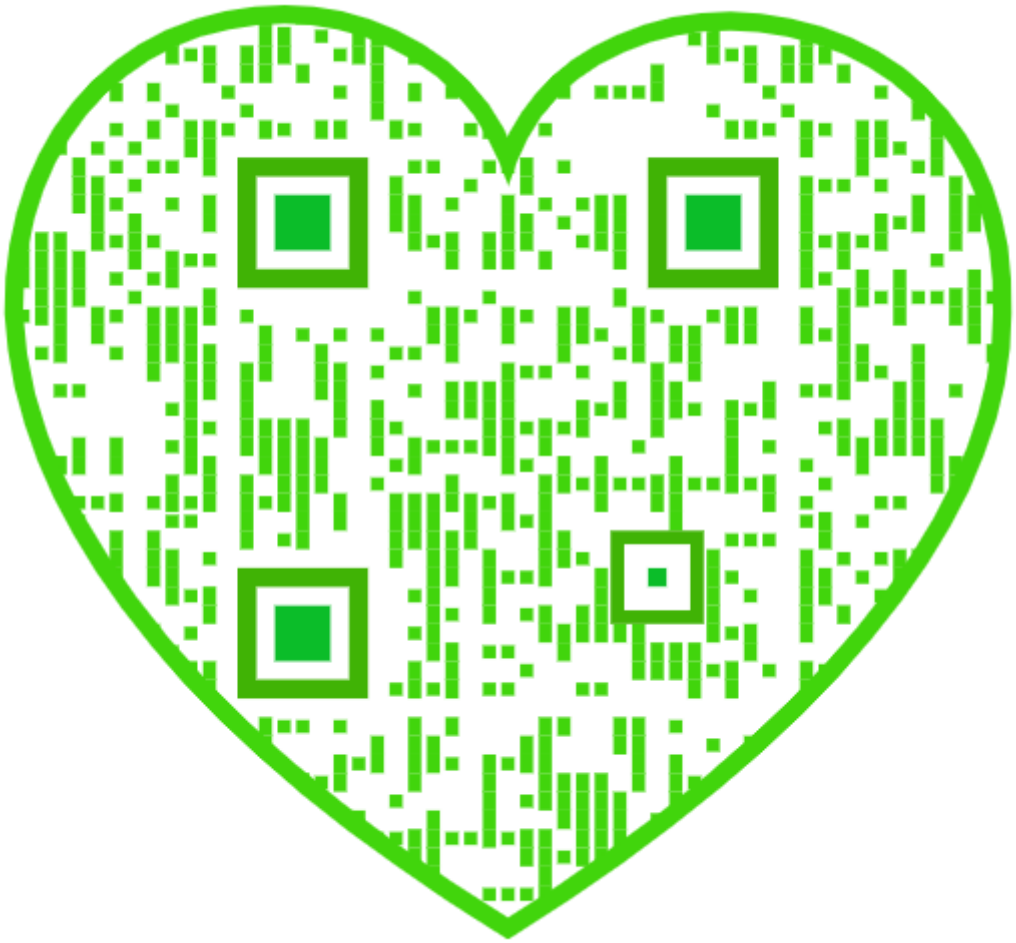
HOME GEOGRAPHY FOR PRIMARY GRADES

HAROLD W. FAIRBANKS



HOME GEOGRAPHY

BY

HAROLD W. FAIRBANKS, Ph. D.
Author of "Stories of Our Mother Earth," etc.

REVISED EDITION

EDUCATIONAL PUBLISHING CO.
NEW YORK CHICAGO BOSTON SAN FRANCISCO

G133
.F16
1915

Copyright, 1903, 1913, 1914
by
EDUCATIONAL PUBLISHING COMPANY

Copyright, 1915
by
EDUCATIONAL PUBLISHING COMPANY

AUG 26 1915

©Cl.A410222

CONTENTS

	PAGE
The Earth Upon Which We Live	11
The Soil	15
How the Soil is Made	18
What Plants Need	25
The Seasons	29
How the Seasons Affect Plants and Animals	34
Three Forms of Water	39
Where the Water Comes From	43
The Wind	48
The Clouds	52
Springs	58
Everything has Weight	63
Water Works for Us	66
The Surface of the Land	71
The Ocean	76
The Work of the Ocean	80
How the River made the Valley	84
The Summer Stream	89
What is Climate?	93
What We Learned by Climbing a Mountain	97
Story of a Mountain	104
Something about Lakes	108
What Rocks are Made of	112
Where Minerals are Found	116
The Inhabitants of the Water	121
The Sprouting Seed	126
Where the Flowers Grow	130

Some Common Trees 137
Something about the Birds 143
Something about the Wild Animals 147
Homes of the Animals 154
Our Homes 159
How People Used to Travel 167
Traveling To-day 171
Occupations 177
Trade and Commerce 181
Hunting and Fishing 185
Farming 189
Stock Raising 194
Lumbering 199
The Country Store 208
Something about a City 211
The Making of Sugar 216
What the Cow Furnishes Us 221
The Story of the Silkworm 224
The Home in the Desert 230
The Home by the Ocean 233
What is a Map? 237

INTRODUCTION.

Too much has been expected of young children in the study of geography. Many of the so-called primary geographies are really not primary. They present a multitude of facts the most of which are beyond the power of the child to comprehend or retain.

Childhood is a period of active memory, but this is no reason why we should attempt to cram the mind with details of geography. Facts themselves are of no value. It is only in their relations that they become significant.

For the child of ten years it is not sufficient that facts be presented in their relations, but that these relations be such as will arouse interest through connection with the child's own experiences.

To expect a child in the fourth grade to draw a map of the state in which it lives, locate the principal rivers, valleys, mountains, bays, cities, and name and locate the counties, is wrong. Parrot-like memorizing of such facts, at that age, can result only in harm. The facts mean nothing and create a distaste for the work.

We must start from home, from the environment of the child. We must build upon what has already become a part of its life. Definitions and disconnected facts cannot be assimilated.

In the home surroundings we can get the materials which, if properly used, may be made the basis for the superstructure in geography. The mind expands as the experiences increase. What the child has seen and felt itself must be the basis for an increase of knowledge.

The home is a little world. Here in miniature are the features of the great world outside. The forms of land and water, the animals and plants, the occupations and industries of men are represented.

When these are understood in their simple relations the child can reach out and take hold of what he has not seen.

This work must be accomplished chiefly through the imagination, an important factor in the education of children. In their play the piece of wood may be a ship, and the water in the basin or pond the ocean. Let us watch this natural reaching out and then we shall be prepared to aid it.

Interest is another important factor. The weaving of the new, the unexplored, with the old and familiar in such a manner as to arouse the interest and attention fixes the new as no other method can.

If the natural method is followed, the child-mind will grow almost unconsciously, taking in and assimilating the materials of knowledge, which if presented in an artificial and uninteresting manner, would require laborious effort to fix.

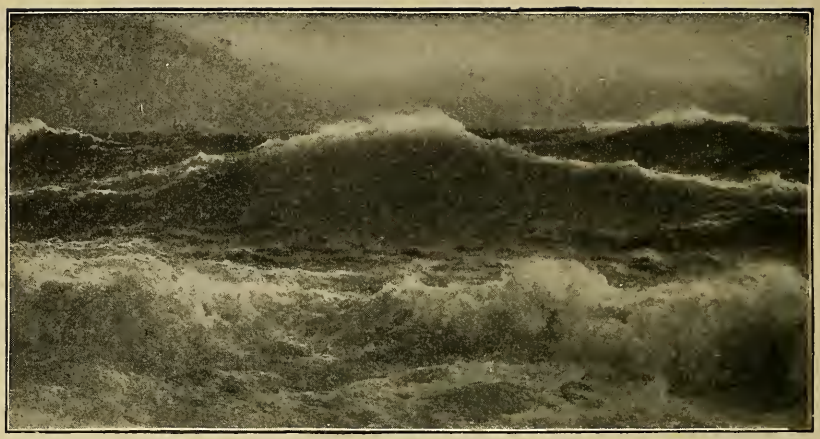
If we use the term nature study for the most elementary work in geography, where the effort is not so much to impart information as to cultivate clear and discriminating observational powers, then the work of the third and fourth grades should be only an enlarg d and expanded nature study.

But whether we call it nature or geography study, we should not forget the chief object to be accomplished.

In this little book the author has attempted not to impart information as such, but to get at the meaning of phenomena by showing the relation existing between their various manifestations. Things have far more interest attached to them when we know their history; how they came to be as they are.

The child wants to know the "why" of what it sees, and in the explanation of this "why" its imagination is developed and interest aroused as in no other way.

HAROLD W. FAIRBANKS.



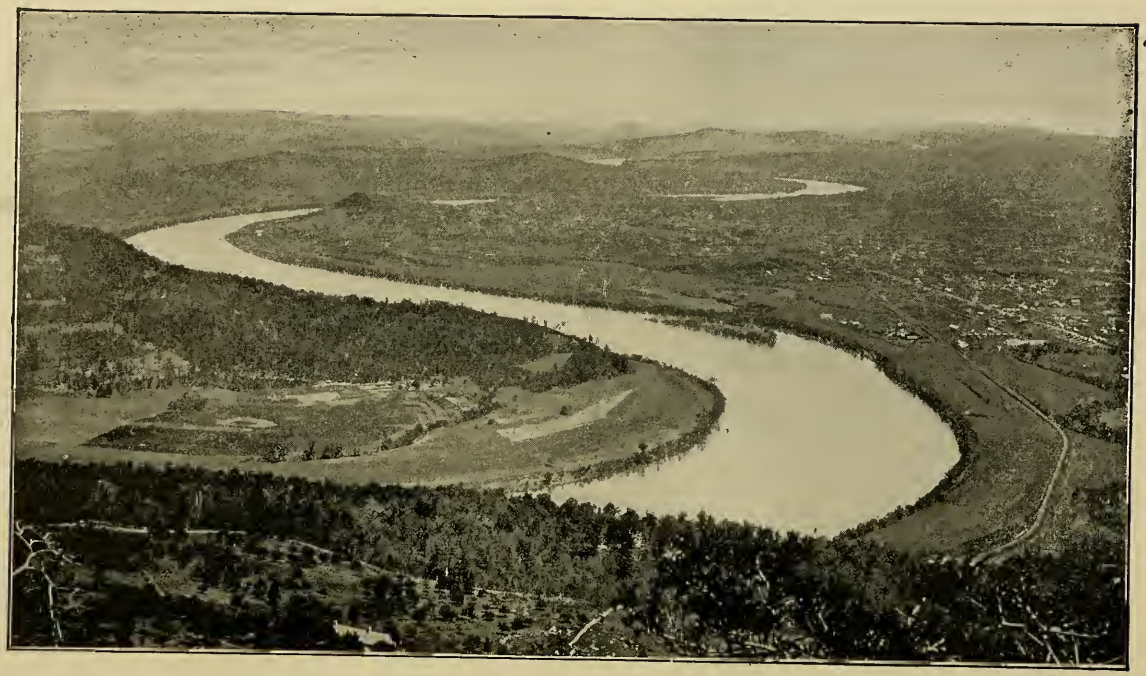
THE WONDERFUL WORLD.

Great, wide, beautiful, wonderful World
With the wonderful water around you curled,
And the wonderful grass upon your breast —
World, you are beautifully dressed.

The wonderful air is over me,
And the wonderful wind is shaking the tree,
It walks on the water and whirls the mills,
And talks to itself on the tops of the hills.

You, friendly Earth, how far do you go,
With the wheatfields that nod and the rivers that flow,
With cities, and gardens, and cliffs, and isles,
And people upon you for thousands of miles?

— *W. B. Rands.*



CHATTANOOGA AND TENNESSEE RIVER.

HOME GEOGRAPHY

THE EARTH UPON WHICH WE LIVE.

We are going to learn about the earth upon which we live. This earth is made up of many things.

First, there is the land where our homes are. Then there is water, which we find in the hollows of the land. Besides the land and the water there is the air. We cannot see the air, but it surrounds us on all sides.

We could not live without land, water, and air. The land furnishes us the most of our food. The land is the home of many kinds of animals and plants. Some of the animals live upon plants, others eat the flesh of weaker animals. We use both plants and animals for food and depend upon them for our clothing also.

Every living thing needs water. Many plants and animals spend the whole of their lives in the water.

Some animals are fitted to move through the

air. We see them flying here and there. Each animal is fitted for the place in which we find it. Fish swim in the water. Horses walk or run upon the land. Birds fly through the air.

The air has many uses. It carries the clouds from the ocean. The clouds make the raindrops which water the earth. Where it does not rain we find neither grass nor flowers.

The land and water are not at all alike. We can walk upon the land, but we sink into the water.

The top of the water is level. The surface of the land is uneven. In some places it is so rough that we can hardly climb over it.

In the valleys between the hills are the rippling streams. The water of the streams is running as fast as it can toward the hollows in the land. In the little hollows we find lakes and ponds of water. The oceans lie in the great hollows of the land. The pond in the little hollow may be so small that you can jump across it. The oceans are so wide that you cannot see the land on the other side of them.

All over the earth we find busy people. In the valleys they are farming. In the mountains they are digging for gold and other minerals. They are sailing back and forth upon the oceans carrying many things from one land to another.

In some places there are great cities where many people live. They are all at work like the ants in their busy home. Some of the people in the cities are doing one kind of work, some are doing another.

Are you not glad to live in a world full of so many interesting things? Do you not want to learn all about it? We must not spend all of our time in play. We will take a part of every day to learn more about the strange and beautiful things around us.

By and by we shall grow up and become men and women. Then we shall have to work. The more we learn about the world the easier our work will be. The world will be our happy home.

WHERE THE SOIL IS DEEP AND RICH.

THE SOIL.

How nice it is to play in the soft dirt. The wind also likes to play with the dirt. It picks up the dirt and blows it in our faces.

When the rain plays with the dirt it makes mud. How the mud sticks to our feet, and leaves dirty tracks upon mother's clean floor. The mud soils our hands and clothes. Is there anyone who does not know how to make mud pies?

We sometimes wish there was no dirt. What do you suppose would happen if our wish should come true? There would be no green fields. There would be no pretty meadows with their carpet of flowers.

Perhaps you know what the gardener calls the dirt in the fields. Did you ever hear him speak of the soil? He says that plants will not grow well if the soil is poor.

Let us find out what the soil is made of. Run out to the garden and get a handful of the dirt or soil. It feels fine and soft in our fingers. Here and there we find little hard grains and pieces of plant stems.

Now place the soil in a basin of water and

shake it well. The water becomes muddy. It looks like the water which you see running down the street when it rains. Put your hand in the basin and at the bottom you can feel something soft like mud.

Pour the muddy water out of the basin into another dish. Pour in more water and again shake the basin. Turn off the muddy water as before. After you have done this a number of times the mud will be gone. Now the water remains quite clear.

Let us see what there is left of the soil. There in the bottom of our basin is a thin layer of sand. It looks much like the sand by the brook or upon the beach, but the grains are not of the same size. The larger grains have sharp points.

The sand by the brook was once mixed with clay. The water as it ran along finally washed the clay away and carried it down toward the river. The grains of sand were made smooth, so that we can find no sharp points upon them.

Let us turn now to our jar of muddy water. After it has stood some hours the water no longer looks dirty. The fine particles of clay or mud which floated in the water have settled to the bottom. The clay feels very soft and slippery. There are no grains of sand in it.

Is there anything else in the water besides the clay? Yes, upon its surface there are many little

pieces of leaves and stems of plants. These are soft and crumble if we try to pick them up.

We have found three things in the soil. There is first the sand, which feels hard and gritty when we rub it in our fingers. Then there is the clay in which we can feel no grit. When the clay dries it crumbles to a fine powder, and looks like the dust in the road. Last of all, there are the little pieces of plants.

Some kinds of soil contain much sand and little clay. Others are formed mostly of clay.

Would you not like to know how the soil is made?

QUESTIONS.

What is meant by poor soil and rich soil?

What is it in the soil which makes it sticky when wet?

Will plants grow in clean sand?

Do all plants like the same kind of soil?

What do you think makes the soil dark? What is the color of the plant stems which you find in the soil?

What is dust?

Pour water on some sand and also on some clay. Into which does it sink faster?

What becomes of plants when they die?

Is the soil in your garden dark colored or light?

What is sand used for?

A TREE PRYING ROCKS APART.

HOW THE SOIL IS MADE.

How is the soil made? Where does it come from?

We can learn something about the soil if we watch the men who are grading a road through the hill. Some of the men are driving horses hitched to great shovels on wheels. The horses pull the shovels over the ground and scrape off the soft dirt. This top dirt we call the soil. It is dark in color and full of grass roots and pieces of leaves and stems of plants.

Below the dark soil the men find the ground harder. Some of them are using picks to loosen it. A little deeper the ground becomes so hard that they can no longer pick it.

Then they bring long iron rods called drills, and make holes in this hard ground. They put powder into the holes and explode it. The ground is blown into pieces which can be shoveled up and drawn away.

This hard ground is called rock. Soil is made from rock. We have already seen that where the men are working the soil forms only a thin layer on the top of the ground. As they dig deeper the soil soon disappears and rock takes its place. If you dig a hole in the ground anywhere you will at last come to rock. In some places the soil is very deep.

Here is a piece of rock which the men have blasted out. How bright and clean it is! There are sharp corners upon it which may scratch your fingers. How strange it is that rock like this can change to soil!

We will take a piece of the rock and pound it to dust. Why cannot we call this pounded rock, soil? It does not look like the dark soil which the men found on the top of the ground.

Let us plant some seeds in a pot of the dust

which we made by pounding the piece of rock. We will also plant some in a pot of the dark soil. In this way we can learn how our pounded rock differs from the soil which Nature made.

In a few days the seeds sprout, and for a time the tiny blades in one pot look just like those in the other. Then a change comes. The little plants in the pot of rock dust almost cease to grow. They lose their bright green color. The plants in the other pot keep on growing. This is because the dark soil is full of food all ready for the plant to use, while the rock dust has but little food ready for the little roots to take up.

We have discovered now that the soil is something more than rock dust. Nature makes the soil from the rock in a very different way.

A long time ago there was no soil covering the rocks. Do you think we could have lived upon the earth then?

For many years the sun shone upon the rocks, and every day they became quite warm. At night when the sun was gone they grew cold. The little grains of which the rocks are made became larger when they were warm and crowded each other. When it was cold they shrank away from each other. In this way little cracks were made.

Rain fell upon the rocks and ran into the cracks

At last the rocks began to soften and crumble into little pieces. In this way a layer of soil commenced. Little plants sent their roots into the soil as well as the tiny cracks. The soil was poor and did not give the plant much food, but after a long time things

ROCKS WITH NO COVERING OF SOIL.

were different. When the pieces of rock had crumbled very fine and pieces of leaves and plant stems became mixed with it, and many little animals had made their homes in it, there was formed the dark rich soil.

Our picture shows another way in which soil is

formed. In it you can see the bank of a stream. Perhaps you have visited one just like it.

The bank is made of pebbles and sand. These were washed here by the water a long time ago. At the top of the bank you can see a dark layer of soil.

AT THE TOP OF THE BANK IS A DARK LAYER OF RICH SOIL.

You can also see the roots of the plants reaching down into the soil. The dark layer at the top is rich in plant food. The sand and pebbles below can furnish very little food.

There are many animals which help form the soil. The ground squirrels burrow in the earth and

make it loose. There are also the earthworms who work the ground over and make it richer.

In every pinch of soil there are still other little living things. They are so small that you cannot see them. Each one is doing what it can to change the little grains of rock into soil.

Now we have seen how Nature makes the soil.

QUESTIONS.

Where have you seen solid rocks beneath the soil?

Have you seen men dig a well? Was the ground soft on the top?

Have you ever found a piece of crumbling rock? Could you break it in your hands?

Get a smooth pebble and try to break it with a hammer. Does it break easily?

If you have been in the mountains, you can tell us something about the rocks you saw there.

Find a bank where you can see the roots of plants reaching down into the soil. What do you find under the soil?

How deep do roots of plants go into the ground?

What do earth worms feed upon?

Mention some of the animals that live in the ground. How do these animals help make the soil better?

What makes rocks crumble?

What does the farmer do to the soil before he plants his seed?

WHERE IT RAINS A GREAT DEAL.

WHAT PLANTS NEED.

There are three things which plants must have. These are soil, water, and sunshine.

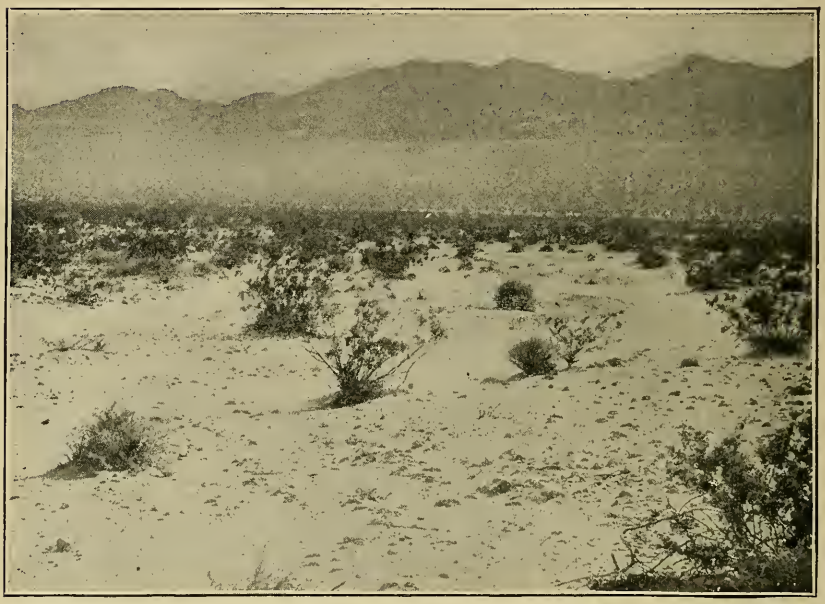
We have already learned what soil is and how it is made. When the little seed falls where there is not much soil it has a hard time to grow. If the rain waters it and the sun shines upon it the seed begins to swell and soon sends out a tiny shoot. This tries to push its way down into the ground, but if there is no soil the young plant dies in a short time.

The soil is deep and rich in the valley. This is the reason that we find the largest trees there. The farmer who lives in the valley raises a larger crop of wheat than the one who lives upon the hill.

Upon the hills the soil is often very thin. In some places the rocks may stick up through the soil. Plants do not love the rocks, for they cannot get food from them.

When the summer comes the plants upon the hills where the soil is shallow dry up and turn yellow. Shallow soil cannot hold water very long. The plants in the valley can reach their roots deep.

There are no rocks to stop them and down they go until they get where the ground is moist.



WHERE VERY LITTLE RAIN FALLS.

Plants need water more than they do soil with food in it. If the soil is poor some of them will manage to grow. If there is no water they will all die. If you forget to water the plants in your window you will soon see by their wilted leaves how thirsty they are. Have you seen the plants in the field droop upon a hot summer day? This is because the sun and air are taking so much water from the ground that the plants soon begin to suffer.

A desert is a place where there is little or no water. In some deserts there are no plants to be seen. In others there are a few plants that have become used to living with only a very little water.

If it should rain in the desert the barren stretches of sand and clay would soon be covered with plants. This shows us that plants can get along without rich soil, but they must have water. Some plants will grow in pure sand if they have plenty of water.

There is another thing that most plants need. This is sunshine. Have you seen potatoes sprouting in the cellar where it is dark? The little stems are slender and pale. If there is a window near they reach out toward it. They try hard to get where there is sunshine.

People need sunshine as well as the plants. Miners who work underground away from the sun are always pale. You never see them with rosy cheeks.

Did you ever think how much you are like a little plant? If you have plenty to eat and lots of sunshine you will grow fast and become strong. The little plant that has plenty of light and deep, moist soil is strong and happy.

Most plants do not grow during the whole year. In the spring and summer they do their work. In the winter they rest. From this we see that plants

need something more than soil, water, and sunshine. They must also have warm weather in order to grow.

Perhaps you live where it is warm in winter. Roses and oranges are blossoming out of doors. Do plants ever rest where it is warm all of the time? Watch some of them and you will soon find out.

HOW THE ROSE CAME.

A little brown seed in the garden,
Asleep under the white snow,
A sunbeam that came in the springtime,
Some raindrops that helped it to grow,
A rose bush, and then a wee rosebud,
With petals that softly unclose,
A perfume that's sweeter than honey,
And there in the sunshine — a rose.

— *Charlotte Lay Dewey*

QUESTIONS.

Mention the things which plants need.

Do you know why the soil is deeper in the valley?

Does the water carry away any of the soil from the hills when it rains?

Of what use are the roots to plants?

What holds trees from falling when the wind blows?

If it should rain in the desert, would the country look different?

Have you ever seen plants growing in water and without soil?

Do all plants need sunshine?

Have you seen any flowers that close in the night and open in the sunshine?

What is it that gives the rosy cheek to the apple?

SUMMER, IN THE SHADE OF THE OAKS.

THE SEASONS.

What is it that looks in at your window in the morning? What brings the light, and wakes up the little birds, and opens the flowers?

It is the sun that makes the day bright. When the sun has gone the dark comes. Then we rest until another morning. The sun is the life of the world. It warms the air and makes everything grow.

All days are not alike. Some are warmer

than others. In the summer the sun climbs higher in the sky than in the winter. The higher the sun is the more heat we get from it. This is the reason that summer is hotter than winter.

Drive a stick into the ground. Now watch the shadow which the sun makes it throw upon the ground. The shadow will be long in the morning and evening. When the shadow is shortest the sun has reached its highest point in the sky. It is then noon.

At noon in the summer the sun is almost overhead. The sun feels hot and the shadow of the stick is very short. The sun is not as high at noon in the winter. The days are not so warm and the shadow is much longer.

If you watch the shadow of the stick for a number of days you can tell whether summer or winter is coming. If the shadow is a little shorter at noon each day the sun is getting higher in the sky. That means that summer is coming.

When the shadow is very short at noon you may know that it is summer. The days are long and the air becomes very warm.

It is so warm that the cattle go into the shade. The birds stop singing. Even the boys and girls forget to play.

After a time it is not so warm. The sun does

not climb so high in the sky. The farmer gathers in the corn. The apples are picked and put in the cellar. This is the beginning of fall.

Soon Jack Frost comes at night and touches

WINTER.

the leaves. We see them dropping from the trees all through the day. Now the air is very pleasant.

The shadow of our stick continues to grow longer day by day. Now it is winter. The trees are bare and Nature seems to have gone to sleep. The farther north we go the colder we find the

weather. There is snow and ice, and people have to build warm fires to keep from freezing. The sun comes up late in the morning and looks down upon the earth for only a little time each day.

A TROPICAL SCENE.

Toward the south it does not get so cold. The sun there does not sink so low in the sky and his heat keeps Jack Frost away. In the south the winter is the pleasantest part of the year. The oranges are ripe and flowers are all around.

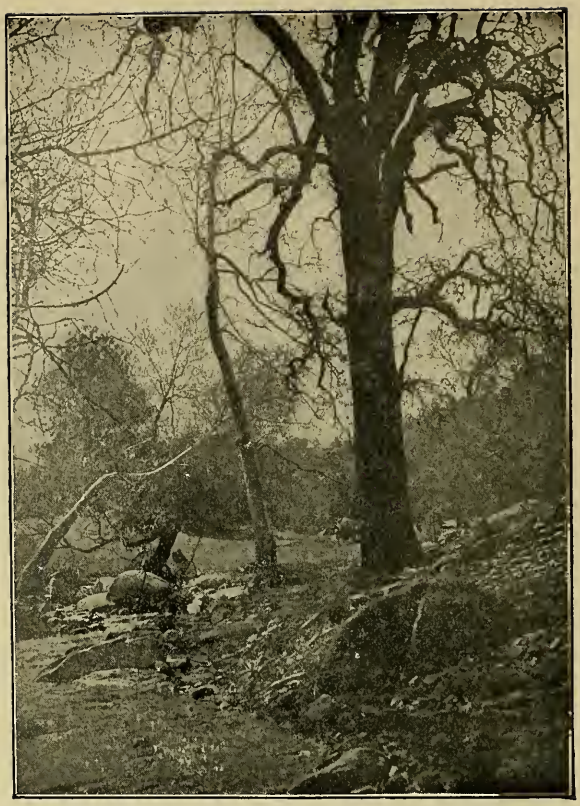
After winter comes spring. The sun again climbs higher in the sky. The days become warmer. The animals come out of their holes. The trees and plants put out their leaves and fragrant blossoms. The birds return and fill the air with their music.

There are four seasons in each year, winter, spring, summer and fall. The time from one winter to another is called a year.

We think that each season as it comes is the nicest. We are glad that the days are not all alike.

QUESTIONS.

Tell all the signs of spring that you know.
How do you know when it is fall?
What time of the year are the nights the longest?
Why does it become cold when the sun goes down?
Does the sun always rise in the same place?
Mention some trees that do not drop their leaves in the fall.
Mention some of the nuts that are ripe in the fall.
When does the snow fall?
What time of the year are the days the longest?
What season is the earth the prettiest?
In which direction does the sun rise?



FALL.

HOW THE SEASONS AFFECT PLANTS AND ANIMALS

We have found that plants need food, water, and sunshine. Plants get their food from the soil.

Animals need food and water, and the most of them love sunlight, but there are some that hide

away from it. Many of the animals get their food from plants, but some feed upon other animals that they can kill.

Everything that lives has its time to rest and sleep. When do you suppose that time is? Can it be in the winter or in the summer, or is it at night? If you said any one of these, you would be partly right.

Most plants and some of the animals sleep a part of each year. The time which they take to sleep depends upon the climate of the place in which they live. The most of the animals sleep a part of each day or night. Plants do not grow as fast at night as they do in the daylight.

In cold countries plants sleep in the winter. We know they are going to sleep when their leaves begin to fall. When the cold winter comes they stand so bare that they look as though they were dead.

When the trees begin to feel the warmer days of spring the sap starts again from their roots. It goes up the trunk of the tree and into each tiny branch. The waiting buds soon commence to swell. Almost before we know it the trees are again dressed in green.

The children all know that spring has come when they can find the pussy willows. The willow

is one of the first trees to wake up and open its little blossoms.

Many plants do not live through the winter. Each spring a new plant grows from the little seed. Very soon we see it blossom. When it is fall and the cooler weather drives away the summer, the seeds are ripe and the first frosts kill the mother plant.

In warm countries plants sleep during the dry season. If summer is the dry season, then they grow in the winter. Such a country is green and beautiful in the winter. In summer the ground becomes dry and the whole world seems dead.

There are many animals that crawl into their holes and go to sleep when fall comes. They do not move until spring wakes them. The first warm day brings them out of their winter home. The earth, the water and the air are full of life, where a little time before everything seemed dead.

Every plant and every animal is suited to the place in which you find it living. If you carry an animal or plant away from its home you must give it a new home much like the old one. If you do not it will die. The animals in the cold north cannot stand the heat of the south. A plant which is used to having a great deal of water will not live where there is little water.

The birds do not stay in one place through the

year. When winter comes they go toward the south. In the spring they return to their northen homes where they make their nests and raise the young birds.

People do not move back and forth as the seasons change. They put on warmer clothing for the winter and store up food to eat. Some animals do the same. Their hair grows longer and thicker and thus they are protected from the cold.

QUESTIONS.

Mention some trees that drop their leaves in the fall.

What trees keep their leaves through the whole year.

Mention some plants that die in the fall.

Do you know any plants that never rest?

What makes the plant begin to grow in the spring?

What is the sap? Where do the roots get it?

Can the tree grow when the ground is dry?

What effect does frost have upon the garden plants?

Do you know any animals that store up food for the winter?

What does the bear do when winter comes?

Did you ever find a snake or lizard in its winter home? How did it act when you disturbed it?

Find a lizard some cold morning and place it in the sun, and see what it will do.

What time of the year do you see the wild ducks and geese?

What becomes of the birds in the winter?

NIAGARA FALLS IN WINTER.

THREE FORMS OF WATER.

We have seen that water is necessary to the life of plants and animals. Now let us try to find out something about the properties of water.

There are three different forms which water takes. Each is very unlike the others. They are so unlike that if we had not seen one change into another we should hardly believe that they were different forms of the same thing.

There is first the common form. You all know this one, it is the water which we drink. If we go far enough in any direction we come to water. It forms all the streams and lakes as well as the great oceans. There is more water than anything else upon the surface of our earth.

Water is a liquid. By liquid we mean something that can be poured. We take a cup of water and pour it into a basin. It takes the shape of the hollow in the dish that holds it. A solid does not act in this way. It keeps its shape.

Water is not the only liquid. There are many others. We have many substances which form solids at the ordinary temperature, but if they are

placed in a very hot place they become liquid. The heavy mineral we call lead is a solid. It is useful in making water pipes and shot. If we heat lead it melts easily and becomes a liquid. It can then be poured like water.

There is another form of water called steam or vapor. When water is heated it changes to steam. The particles of water forming the steam are so small that if you could look into an engine boiler you could not see them. When the steam comes out of the engine into the cool air the little particles run together and form others large enough so that they can be seen. Now we have a dense white cloud about the engine.

When water is changed to steam it takes up very much more room than it did before. Each of the tiny particles of water in the steam is very warm. It wants lots of room. Each one pushes against his neighbors as hard as he can. This is why the lid of the tea-kettle jumps up and down.

When steam is shut up tight we can make it work for us. The little particles push with such strength that they can make the wheels of a heavy engine turn around, and draw a long line of loaded cars.

There are tiny water particles all about us in the air. They are invisible except when they turn

into clouds or fog. At night they form the dew which makes the grass so wet.

The third form of water is ice. When water becomes very cold it turns to a solid substance which we call ice. We all know how clear and smooth ice is. We cool our water with it upon hot summer days, and in winter we skate over its slippery surface. The children of warm climates do not know the pleasure of skating. Where do you suppose the ice comes from that is used where it is never cold enough to freeze water?

We call ice frozen water. When the air becomes warm the ice begins to melt. In a little time a cake of solid ice will change to water.

When water freezes it wants a little more room than it did before. This is why your pitcher is broken when the water in it freezes.

Hailstones are frozen raindrops. The drops of water falling through the air sometimes become so cold that they turn to ice.

Can you tell what the pretty snowflakes are made of? They are frozen clouds. They fall very gently and make everything pure and white. Each flake has six sides or points like a star.

If you live in the South and have never seen the snowflakes get your papa to take you to the mountains when the winter storms come.

QUESTIONS.

Mention some other liquids besides water.

How is a solid different from a liquid?

What makes water boil?

What are the little bubbles in boiling water formed of?

How do clouds differ from steam?

Mention some solids that can be melted.

Can you think of any other vapor besides steam?

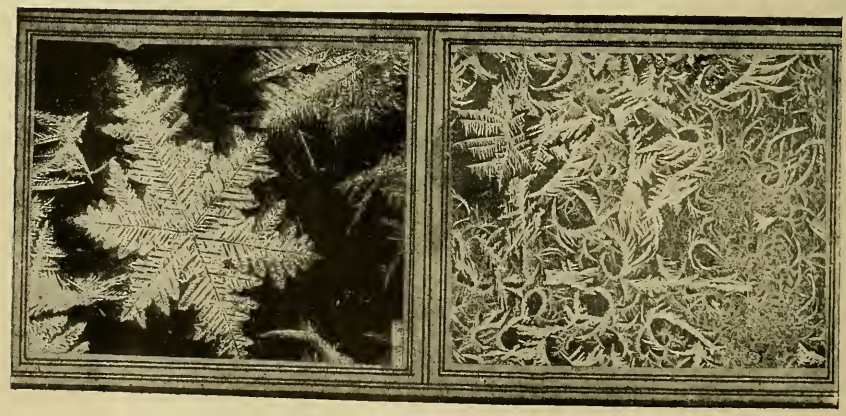
Burn a sulphur match and you get a smell of sulphur. Can you see the sulphur particles in the air?

In warm countries water does not freeze. Where do they get the ice which is used?

Is ice lighter or heavier than water?

What is the difference between snow and hail?

Does it ever snow where you live? Why does it snow upon the mountains more often than in the valleys?



SNOW CRYSTALS.

THE OCEAN.

WHERE THE WATER COMES FROM.

Day and night the brook ripples over the pebbles. It never gets tired and never stops. Did you ever wonder where the water of the brook comes from, and where it is going?

Let us follow up the brook and see where it starts. Back into the hills we must go. We leave the meadows and the pretty valley. Up we climb until the slopes become steep and the brook dashes from rock to rock. Still smaller brooks join here and there, but we follow up the main

one until at last we find where the stream starts. Under a mossy bank there is a clear spring. The water comes bubbling up out of the ground and runs singing away down through the hills.

If you want to know where the water of the spring comes from you must ask the raindrops. If we can find the home of the raindrops we shall find where all the water comes from.

We are sure that the raindrops are the source of the spring, for in the desert, where it does not rain, there are no springs.

It does not rain when the sky is clear. The drops of water come from the clouds which come up and hide the blue sky. Where do the clouds come from? We will follow them back to where they start. We pass over valleys and hills, and at last find ourselves far out over the ocean.

The ocean is the home of the clouds. The ocean stretches farther than we can see. It covers three fourths of the surface of our earth. From over it all the little water particles are rising day by day. When they get up where it is colder we can see them. Now we call them clouds.

How do we know that water particles are rising from the water into the air. We set a basin of water out doors and after a few days the water has disap-

peared. It could get away only by going off in the air.

We cannot see the water particles leave the basin, but if we watch a pond of water when the air becomes cool at night we shall learn something about it.

Sometimes you will see a thin cloud or mist rising from the water. You can see the mist only when the water is warm and the air is cool. You remember that steam from the engine boiler becomes visible when it comes out into the air because the air is so much cooler.

The mist rising and hanging over the pond is made of water particles. On cold mornings you can see them in your breath. How often you have puffed your breath out and played that you were a steam engine. Your breath contains these water particles all of the time, but they can be seen only when the air is cool.

The most of the water particles in the clouds start upon their journey from the ocean; for the ocean, you know, contains the larger part of the water upon our earth. The winds blow across the ocean and over the land. They carry the water particles, or vapor, with them. When they reach a region of colder air they form great masses of clouds. At last the little particles of water unite to form

drops. These are so heavy that they cannot remain in the air any longer and so fall to the ground.

Some of the water sinks into the ground. This makes the cool springs. The rest runs away on the top of the ground. It becomes dirty and forms the muddy rills which we see during a rain storm.

All over the world streams of water are hurrying to the ocean. If the water never came back the ocean would by and by become dry, just as our basin did.

If there were no clouds the water would soon all gather in the ocean. The dry land would become a desert and nothing could live upon it.

So the water is always traveling from the earth to the sky and back again. The same particles never go in the same place twice. They are always seeing new places and meeting new people.

The water in the ocean is useful to us. It bears the ships from one part of the earth to another. In the sky it forms the clouds which furnish the refreshing rain. As cool springs, it satisfies our thirst. At last, as little brooks, it runs away to join the river, and the river bears it again to the ocean.

THE RAIN.

When the rain is over,
  When the clouds have pass'd,
And the golden sunshine
  Beams again at last;
All the earth is fairer,
  Every freshened flower
Lifts its head to answer:
  "Thank you, little shower."

— *Constance M. Lowe.*

QUESTIONS.

What time of the year does it rain the most?

From what direction does the rain come?

When are the brooks the lowest?

Would the brooks dry up if no more rain fell?

Is spring water clear or muddy?

Why do many flowers grow about springs?

Where do the rivers empty their water?

Why does not the ocean fill up and overflow its banks?

Of what use are rivers?

Where does water run the faster, up in the hills or down in the valley?

How do people get water where there are no springs or running streams?

A STORM ON THE COAST. *Millet.*

THE WIND.

What is the wind? We can feel the wind blowing upon our faces. We can see what the wind does, but we cannot see the wind itself.

Sometimes the wind blows against us so strongly we can hardly stand up. The wind carries our hats down the street. It tips over houses and great trees.

All about us there is something which we can not see. We call this the air. The air keeps us alive. At every breath our lungs are filled with it.

When the air moves we feel it pushing against us. Wind is then only the air in motion. The air

surrounds the whole earth. It is never quiet, but is always doing work. It makes the windmills go around, and sends the ships across the sea.

On a summer day the wind cools our cheeks and rustles gently in the trees. In the winter it is fierce and strong. When it blows very hard we say there is a storm. Then the air rushes swiftly along and sometimes does a great deal of harm.

Now what is it that makes the wind blow? You have all sat by the fireplace and watched the flames roar up the chimney. The fire makes the air near it very hot. Hot air is lighter than cold air, and is pushed upward by the cold air which rushes in and takes its place. As soon as the cold air becomes warm, it, in turn, rises, and this makes a wind up the chimney. We say the fire draws well when the air moves fast. You cannot see the air moving, but hold a little paper windmill in front of the fireplace and it will turn around as it does in the wind out of doors.

Winds blow over the earth for the same reason that air draws up the chimney.

The sun shines upon the earth and makes it hotter in some places than in others. Where the air becomes hotter it rises faster, and the cool air rushes along to the place where the hot air was. When this happens we feel the wind blowing.

The wind may blow from any direction. The north wind is usually cold. It makes us shiver and put on our coats.

The south wind is warm. It brings the rain and the spring flowers. The south wind wakens all Nature from its winter sleep.

When clouds cover the sky and the south wind blows, people say it will rain.

After the rain the wind changes and blows from the north. It soon chases all the clouds away. Now we have fair weather.

QUESTIONS.

We cannot see the air. How do we know that there is such a thing?

What time of the year is there the most wind?

What time of the day does the wind blow the least?

Mention some kinds of work done by the wind.

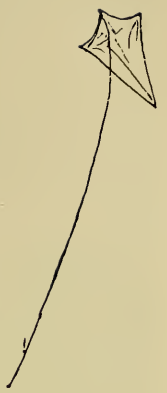
If the air is hotter over the land, will the air blow toward the ocean or from the ocean?

Where do people go in summer to get cool breezes?

What damage is sometimes done by storms?

Mention the different winds which blow where you live.

What is it that makes waves upon the water?



THE WIND.

I saw you toss the kites on high
And blow the birds about the sky;
And all around I heard you pass,
Like ladies' skirts across the grass—
O wind, a-blowing all day long,
O wind, that sings so loud a song!

I saw the different things you did,
But always you yourself you hid,
I felt you push, I heard you call,
I could not see yourself at all—
O wind, a-blowing all day long,
O wind, that sings so loud a song!

O you that are so strong and cold;
O blower, are you young or old?
Are you a beast of field and tree,
Or just a stronger child than me?
O wind, a-blowing all day long,
O wind, that sings so loud a song!

— *Stevenson*

STORM CLOUDS WITH THUNDER HEADS ABOVE.

THE CLOUDS.

The dark clouds are coming up. They are sweeping over the blue sky and will soon hide it. Why do you suppose they rush along so swiftly? It is because the wind is chasing them. It is blowing behind them and they cannot stop.

There are many kinds of clouds. Can you tell us about some of them? I am sure you know the storm clouds. They look dark and angry. Wherever they go they strew raindrops over the earth. The farmer welcomes them, for the thirsty land

needs water. They will make the meadows green again.

The rain may pour down from the clouds for many hours. Sometimes they give us so much water that we are afraid it will flood the earth. But at last the clouds seem to become tired. They melt away and let the bright sunshine down on us again.

How thankful all Nature seems for the refreshing rain! The birds sing again, and everything is bright and fresh.

Who does not love to watch the thunder clouds upon a summer day? After the sun has risen high in the sky and the air becomes warm, little clouds appear here and there in the blue sky. They act as if they were lost, and we wonder what they can be doing. They keep growing larger and larger, and at last pile up in great rounded masses. The sky is, at times, almost filled with these towers of white.

As we look at these clouds we might imagine that they are hills and mountains far away. Or fancy we can see in their changing shapes the forms of very strange and wonderful animals.

At night we love to watch the flashes of light that come from the thunder heads. The lightning darts here and there. Sometimes we hear the thunder. It sounds like a distant wagon rolling over the stones.

The fleecy clouds are very different from the storm clouds and thunder clouds. They do not give us rain. They seem to have nothing to do. There they float so daintily, as if only for us to look at them. They seem like patches of cotton dropped across the sky. The sun plays hide and seek among them. Now the sun shines hot upon us, now the little clouds hide it.

There is another kind of cloud. I wonder if you have seen it. Clouds of this kind float high in the sky, far above all the other clouds. They look like dainty wisps of soft hair. They are called cirrus clouds.

The clouds which you have seen hanging around the top of a mountain form there because the air is cold. We have learned already that cold changes the little water particles floating in the air into such form that we can see them.

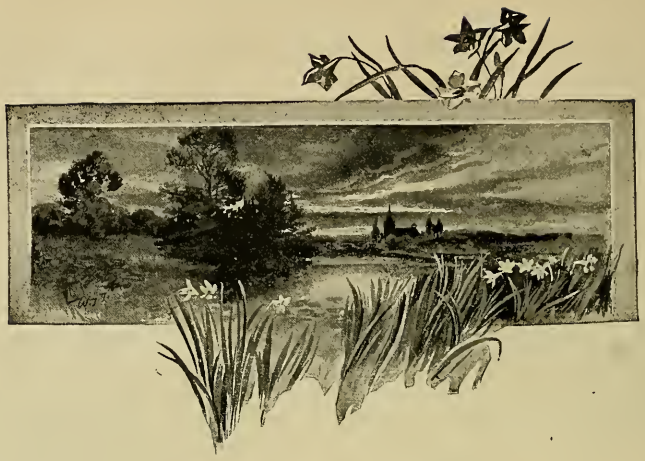
When clouds come down to the ground we call them fog. We do not love the fog. It shuts us in so that we can hardly see which way to go. Watch the fog closely and you will see the little water particles of which it is made. These hang themselves upon our clothes and we soon feel damp.

Have you ever stood upon a hill far above the fog? As you look down upon the fog it seems like

a great ocean of water. The hills rise above the fog like islands.

FOG.

Fog is quite useful in countries where it does not rain much. It protects the ground and plants from the sun so that they do not dry up so quickly.



THE RAINDROPS.

Down on the wide blue ocean,
The lakes, and the little streams,
So loving, so warm, and tender,
The sun sent his golden beams,
That the ever changeful water
Grew warm and began to be proud,
And longed to fly away and away,
To be a soft white cloud.
So some of the drops grew very small,
As fine as a fairy's hair,
As light as a fairy's foot-fall,
Which is lighter than the air.
Then up, up, up they hurried
To fly was such a delight;
They cast not one look backward
Till they were out of sight;
They only thought of the playtime,
And the rollicking fun of it all;

And forgot that true is the saying,
"Pride goeth before a fall."
And when they had gone so very far,
That the earth was out of sight,
They met a current of ice-cold air,
And it gave them such a fright,
That they ran together in little drops,
And clung to each other tight;
So they tumbled down together,
And we had rain that night.

— *M. K. F.*

QUESTIONS.

From what direction do the rain clouds come?

What wind brings fair weather?

What time of the day are there the most thunder clouds?

What makes the thunder?

What is dew? Frost?

When does the dew fall?

If you fill a glass with cold water upon a warm day, what appears upon the outside of the glass?

When do you have the most fog, in the morning or middle of the day?

What makes the fog disappear?

What makes the clouds which float about the sides of the mountains?

Where does the more rain fall, upon mountains or in valleys, and why?

Tell something about the clouds when you think it will rain.

GEYSER "OLD FAITHFUL," YELLOWSTONE PARK

SPRINGS.

Hour after hour the rain beats against the window. Where can so much water go to? Some of it runs down the street in muddy torrents. Some of it soaks into the ground. You have seen a sponge absorb water. The ground takes up water in much the same way.

After the rain stops we find little ponds in all the hollows. In a few days the water is gone.

What do you suppose has become of it? You have already learned that water particles are rising from the ocean all of the time. They are rising also from every pond of water. The basin of water left upon the door step will become dry if it stands a few days.

All of the water of the pond does not change to vapor in this way and disappear in the air. A part slowly sinks down through the ground. Down, down the water goes into the soft soil. Finally it reaches the rock which we have learned is below the soil. Does the water stop then? No; for there are little cracks in the rock. The water slowly creeps into these cracks and so keeps on its journey into the earth.

The cracks are small and the water goes slowly. Finally some of the little cracks unite and form larger ones. In the larger cracks the water can run faster and now we have a bubbling little stream. It is far, far below the ground on which we walk.

Will the water ever come out into the sunshine again? Let us see. The land, you know, is not smooth. There are hills and valleys and cañons. As the little streams flow along underground some of them may come to one of these cañons or ravines. If a cañon lies in the path of a little stream it will all at once slip out through the rocks into the bright sunlight.

In such a place we have a spring. The water which was muddy once is now clear. The dirt was lost in the long journey under ground. We think there is no other water as good as spring water.

The ferns and grasses love the water. They grow up and shade the spring from the hot sun. It is pleasant to think that they do this through gratitude for the pure water given them.

Many of the underground streams never find a cañon in their path. They go deeper and deeper into the earth. At last they come where the rocks are very warm. The farther they go the hotter the rocks become. At last they are hot enough to turn a part of the water into steam.

The steam will not let the water behind it go any farther. It pushes the water back and makes it flow toward the top of the ground again. When this water comes out upon the top of the ground it forms a hot or boiling spring. You can cook eggs or potatoes in such a spring. The water of hot springs is often used as a medicine. This is the story of the water that was lost in the ground.

When people dig wells they try to find one of these underground streams. They often do find a tiny stream. Sometimes they find one so large that they have to climb out of the well very quickly.

QUESTIONS.

Have you ever seen a spring? Describe its appearance.

Which does water sink through quicker, sand or clay?

What kind of soil is it where ponds of water stand a long time?

What makes the water of some springs so cold?

What do we mean by saying spring water is hard? What do we find in the bottom of the tea-kettle after spring water has been boiled in it a long time?

What is a mineral spring?

Tell why some springs have warm or hot water.

Do springs ever dry up in the summer?

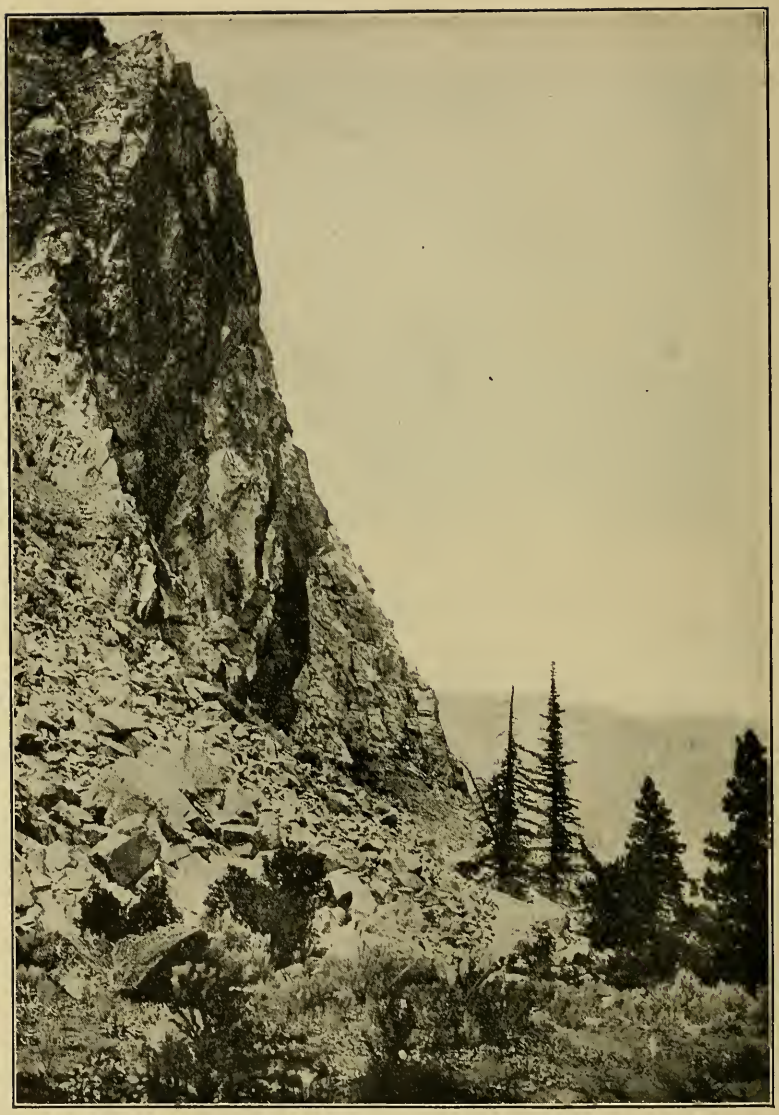
Describe a well.

How is the water gotten out of a well?

How does a well differ from a spring?

What makes you think the earth is hot inside?

Of what use are hot springs?



THE CRUMBLING CLIFF

EVERYTHING HAS WEIGHT.

We have all seen a magnet. We have watched it pick up little pieces of iron and hold them tightly.

The great earth upon which we live acts like a magnet. It pulls everything toward itself. The pull or attraction of the earth is what makes things have weight.

A piece of iron is heavy. You can hardly lift it because the earth pulls it strongly. A piece of wood the same size as the iron is light. You can lift it easily because the earth does not pull it so strongly.

If you throw a ball into the air it falls quickly to the ground. A feather will fall, but not so quickly, because the air holds it up.

You tumble out of a tree and are hurt. It is the earth pulling you that makes you strike the ground so hard. The higher you are in the tree the more the fall will hurt.

How easy it is to run down hill. It is hard work to climb back up the hill. The earth is pulling you down the hill. If you stumble it may cause you to fall.

If it were not for the pull of the earth we could

not go coasting. It you threw a ball in the air it would not come back to you.

The pull of the earth is helping to tear down the mountains. Did you ever think of that? At the foot of the cliffs there are great fragments of rocks which have fallen from above. If you climb the cliff you will find many pieces of rock ready to fall. Push one with your foot. Down it goes tumbling and rolling to the bottom.

It is the pull of the earth that makes water run down hill. Look out of the window when it rains. The little streams of water are hurrying past. The earth is pulling them and they are trying to find the lowest place. Perhaps they will have to run many miles before they can rest.

Here is a hollow in the ground. Some of the water has found it and formed a little pond. Take a spade and dig a ditch through the rim of dirt which holds the water. Away it goes through the ditch. The earth is pulling it and it cannot stay.

The earth pulls the balloon as it does everything else, but the balloon rises because it is lighter than the air. Ducks can swim upon the water because they are lighter than the water.

A stick floats upon the water because it is light, but a piece of lead drops to the bottom. It is

heavier than the water and the earth pulls it down to the bottom.

QUESTIONS.

What would happen if the earth stopped pulling things toward itself?

What makes things feel heavy?

What is the heaviest thing you know?

Which falls quicker, a feather or a ball? Why?

Why will a wagon tip over on a side hill?

What is another name for the pull of the earth?

Why is it dangerous to climb along rocky cliffs?

Does water run on level land?

How can you tell which way the road slopes?

In what part of their course do streams run the swiftest?

Why does water stay in a pond?

Does the earth pull children or grown people the most?

How much does the earth pull you?

THE WORK OF RAINDROPS.

WATER WORKS FOR US.

We train horses to draw our wagons. We put up windmills. The wind makes them go round and pump water for the cattle to drink.

The sailor places sails upon his vessel and the wind blows him merrily along. The engineer places water in a boiler and heats it until it changes to

steam. The steam makes the engine move and work for us.

Can you think of any other thing which we harness and cause to work for us?

Long ago people did not know that steam could be made to do work. Then they used water to make their mills go and grind the grain.

Let us look around and see the work which water does. When a raindrop strikes your face it hits a tiny blow. The raindrops which run from the roof dig a little ditch by the side of the house. When thousands of little raindrops meet and travel together they often do a great deal of work. Sometimes we wish that they did not do so much work.

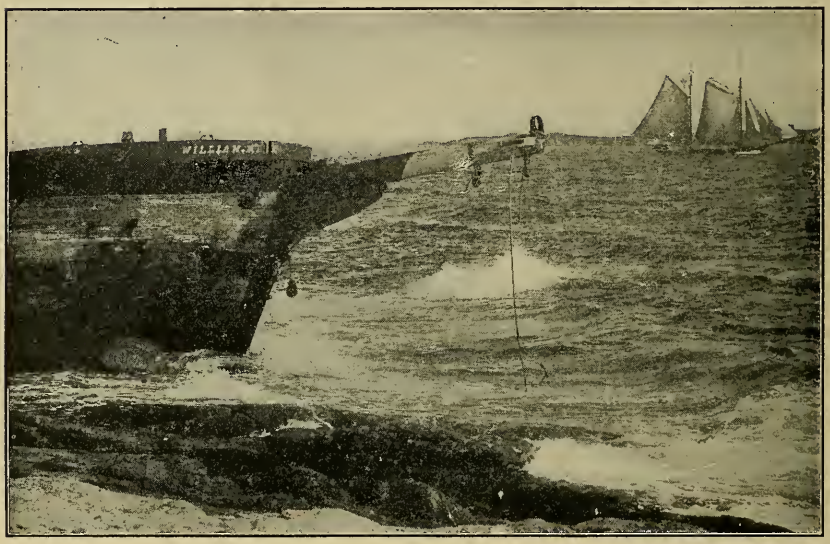
As the raindrops rush along they dig a deep ditch in the soil. They do this by carrying off the dirt, grain by grain. They become very muddy, but they do not seem to care.

Have you ever seen great holes washed in the road by the torrent of raindrops? People cannot travel for a time. It may take many men several days to fill up the hole made by the torrent.

If you live by a river or mountain brook you have seen the water roll pebbles along. The river sometimes washes away people's houses. It has destroyed whole farms.

The waves of the ocean also do work. They

never become weary. They are tearing the rocks down and grinding them to pieces. They make the sand which you delight to play in.



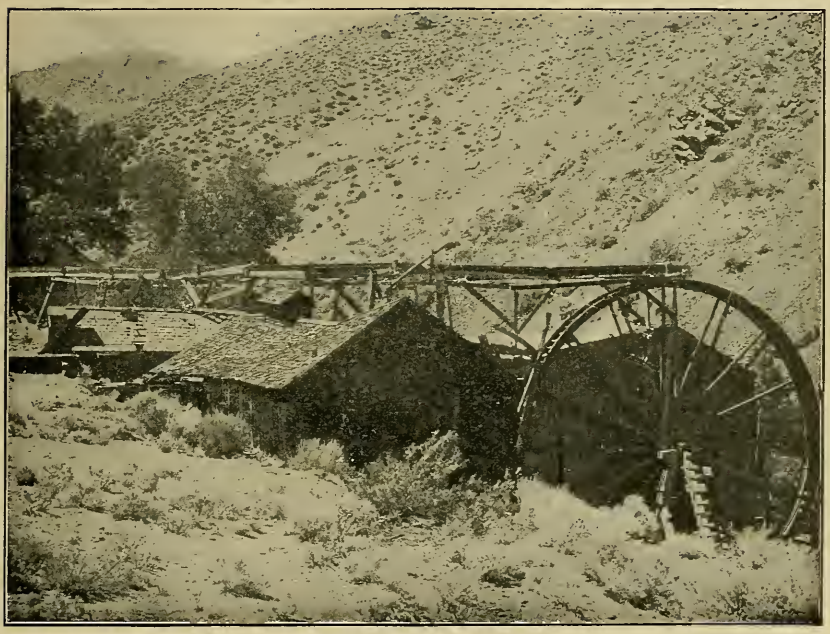
A WRECK ON THE COAST OF MAINE.

Sometimes the waves throw great ships against the rocks. They seem to be happy in breaking things in pieces and doing all the harm they can.

How do you suppose men harness the water and make it work? It is a pleasant trip to the old mill. There we can learn more about the work of water, and how water is harnessed.

The mill stands by a little creek. Above the

mill you will see a pond of water held by a dam. The dam is made by piling logs or rocks across the bed of the stream. The dam holds the water back so that it cannot run along as it used to do.



A WATER WHEEL.

Upon one side of the mill-pond the miller digs a ditch. At the lower end of the ditch he places a large wooden wheel. This is called a water wheel. When the dam is full of water the miller turns the water into the ditch. The water runs through the

ditch and onto the wheel. The weight of the water makes the wheel turn around. The wheel makes the mill go to grind the grain or do any other kind of work. The mill may weave cloth. It may make electricity to give us light.

Mills are sometimes placed where there is a water-fall. Then it is not necessary to make a dam.

QUESTIONS.

Mention some of the things which work for us.

Mention some of the kinds of work which you have seen water do.

What does the river do with the dirt which it washes from its banks?

What kinds of work does the ocean wave do?

Describe a stream near your home after a hard rain.

Tell how water makes the water wheel turn around.

How are dams made to hold the water?

What harmful kinds of work does water do?

What makes the water come out of the hydrant with such force?

In what kind of a country will water do the most work, a hilly or level one?

Would there be any waterfalls if there were no hills?

A PLAIN

THE SURFACE OF THE LAND.

Do you live where the land is smooth almost as far as you can see? Your home, then, is upon a plain.

The plain seems as level as a floor. But is this really so? If the plain were perfectly level the rain which falls upon it would not run off. The land might then be flooded.

Can the river tell us anything about the slope of the land? Let us see. Stand upon the bank for

a time and watch the water. Does it stand still like the water in the pond or does it move? Watch that little stick upon the water and you soon can tell. See, the stick is moving. It comes nearer. It floats in front of you, and soon it is out of sight.

This shows us that the water in the river is moving. It is flowing across the plain on which you live. The plain must slope a little. The slope is in the direction in which the river flows.

Is your home in a valley? Then you live on the lowland between hills or mountains. The valley is long and narrow like a great trough. A river flows into the valley at one end and out at the other end. You can easily see that the valley slopes in the direction in which the river is flowing. The steeper slopes are upon the sides of the valley where the little brooks trickle down to the river.

Your home may be far above the valley and in the mountains. Then there must be rough rocks and steep slopes all around your home. There is just enough smooth land upon which to make a little garden. Here you have no trouble in telling which way the land slopes. The land is so steep that if you are not careful you will fall and get hurt.

The water of the mountain brook does not flow quietly like the river in the plain. It tumbles noisily

over the rocks. It will at last join the river by the easiest path it can find.

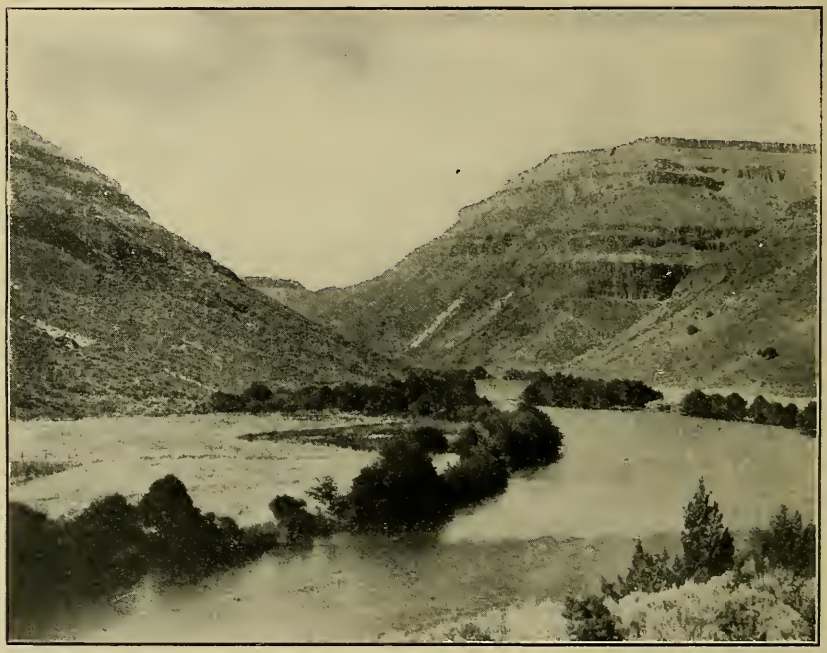
Wherever we go we shall find the land sloping in some direction. The broad, gentle slopes we may

A VALLEY.

call plains; the open hollows between the hills or mountains are valleys; while the deep gashes which the rivers cut in the mountains are cañons.

If we follow the river to its head we shall see

these three different land surfaces. In its lower course the river winds here and there over a broad plain. It seems as if it hardly knew which way it wanted to go.



A CAÑON.

After passing the plain we find hills beginning to rise on either side of the river. We pass up the valley which the river follows between the hills. The land along the river is rich and we see many farms.

After a time the valley narrows and the river

flows more swiftly. At last we come to a place where the hills come close to the river. There is no land between the rocky slopes and the river. The river rushes along between steep cliffs which almost shut out the sun. Now we are in a cañon. We follow the cañon far back into the mountains until it splits up into many little ravines. Each of these has been formed by the waters of many springs.

QUESTIONS.

Describe the country about your home. Is it a plain, a valley or a mountain on which you live?

Where do you find swampy places?

Have you seen the river flood the lowland along its banks?

What makes the flood? Does it do any harm?

How do you think the valleys were made?

Do you think that water had anything to do with making the valleys? Why?

How does a valley differ from a plain?

Have you ever been in a cañon or ravine? If so, describe it.

What is the difference between a hill and a mountain?

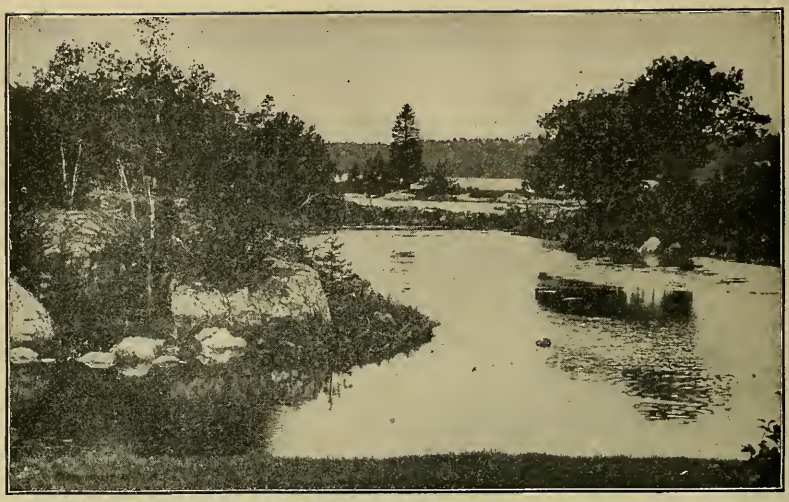
Where do the streams run quietly, in the valley or high in the mountains?

Where do the rough rocks stick up and form cliffs for waterfalls?

Is there much level land in the mountains?

Where are there the most farms, in the valley or in the mountains?

Where does the water of the river go to?



THE OCEAN.

Where is all the water of the river hurrying? It tumbles over the cliffs. It dashes past the rocks.

The source of the river is in the mountains. It is formed by the little rills that are forever fed by the springs. The rills unite as do the branches upon a tree. At last they make the mighty river.

The river soon leaves the mountains. It flows slower, for its bed is not so steep. Now it rests in quiet pools shaded by willows. Now it ripples in soft music over its sandy bed.

Finally the river reaches a broad plain through which it slowly winds. It does not want to go farther. It seems to know that a little beyond the

great ocean waits for it. The river will soon be lost in the ocean. Its work will be done.

Rivers are flowing into the ocean from all the land upon our earth. Would you not think that by and by the ocean would fill up and run over its bank? Stop and think a moment. Have we not learned that water particles are leaving the ocean every moment and forming clouds? The water is being lost from the ocean as fast as it comes in. This is the reason it always remains the same. The water which the clouds carry away at last comes back in the rivers.

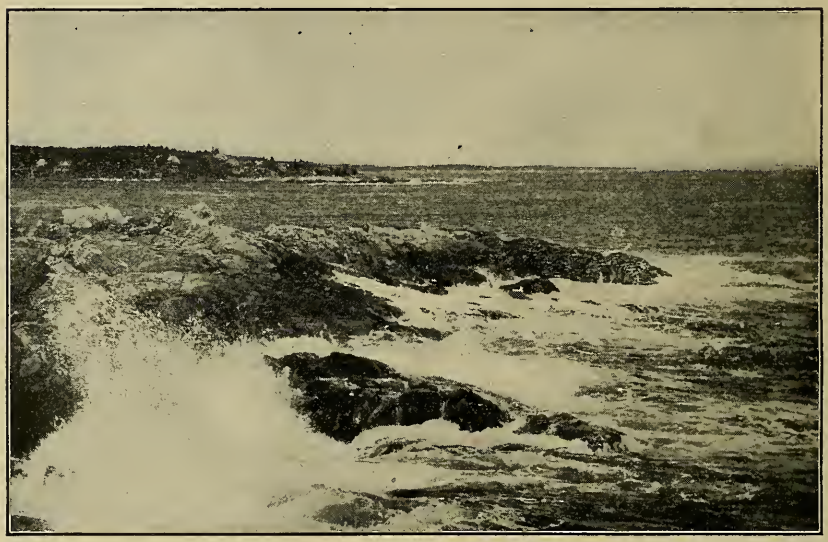
You can now tell the story of the raindrops. It is a long story from the time they leave the ocean until they get back again.

The ocean contains something which we put in our food. If you have tasted ocean water you know what this is. Place a pinch of salt in a cup of water. The salt dissolves in the water. It makes the water taste much like that from the ocean.

Let the cup of water stand in a warm place for a few days. The water will go off as vapor. The little water particles will spread through the air, but you cannot see them. Is there anything left in the cup after the water has gone? Yes, there in the bottom is the salt which we dissolved in the water.

The little water particles when they turn to

vapor can not carry away the salt. This is why the clouds do not contain salt water Would it not seem strange if the raindrops were salty? We would think the clouds were shedding tears.



About three-fourths of the earth upon which we live is covered by the ocean. If there were a little more water the oceans would cover nearly all the land. The fertile plains would be beneath the water. There would be left only the mountains rising above it.

The islands in the ocean are the tops of mountains. If there were less water in the ocean many of the islands would be connected with the continents.

Who can tell why the ocean is where it is? Water, as we have learned, runs into the lowest place that it can find. We have also learned that the surface of the earth is uneven. There are hills and valleys and plains.

When the water was formed it ran into the lowest hollows upon the earth, and in this way the oceans were made.

QUESTIONS.

Have you ever seen a river?

Tell us where it comes from and where it is going.

Why does not the ocean fill up and overflow its banks?

Tell the story of the raindrops.

When does the ocean lose the most water, on a cold day or on a warm day?

How can you show that water is passing into the air all the time?

Of what use is the ocean to us?

Is ocean water good to drink?

Where does our salt come from? Can you tell how it is made?

If you put some salt in a cup of water, how can you get the salt again?

Is your home upon an island or a continent?

If you have ever seen an island, tell what it is.

If there was much more water on the earth what would happen?

How is the ocean different from a lake or pond?

THE WORK OF THE OCEAN.

Did you ever think how much work the ocean is doing? If you have ever visited the ocean you know that it is never quiet. The waves are always beating against the shore and sometimes it seems as if they would wash the solid land away.

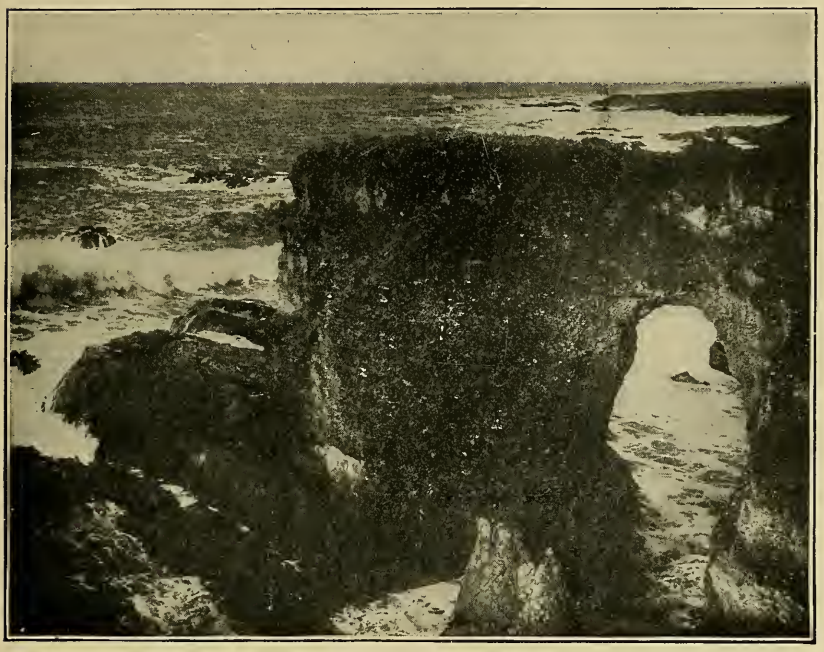
The ocean is doing different kinds of work. It is like a great animal that men have harnessed. When it is in a pleasant mood it carries the ships safely upon long voyages. When it is angry it often hurls the ships against the hard rocks and breaks them in pieces.

In many places the waves of the ocean are slowly tearing down the land. In other places they are building up the land.

The picture on the next page shows a rough and rocky part of the coast. The waves whiten the ocean with foam as they dash against the cliffs. Here we can easily see that they are doing work. With every storm the waves tear away a little of the land. They are digging holes and caves. We can see them in the picture.

Where the rock is soft the waves work faster

and soon make a little bay. The hard rocks wear away slowly and after a time they form points of land sticking out into the water. Sometimes the



THE WAVES ARE SLOWLY TEARING DOWN THE LAND.

waves wash around these points of land and make islands of them. Many of the little islands along the coast have been made in this way.

How do the waves work? Have they any tools? Let us see. If we walk along the base of the cliffs at low tide we find the shore strewn with

rounded pebbles. As each wave breaks and rolls back into the ocean we hear the pebbles grinding upon each other.

When the tide comes in and the waves again reach the cliffs they pick up the pebbles and hurl them against the rocky banks. They keep doing this day after day, and do you wonder that at last they make hollows and caves in the solid rock?

The larger pieces of rock, which are broken from the cliffs, the waves leave upon the shore until they are smoothly rounded. The little pieces they carry far out, and, at last, where the water is quiet, let them sink to the bottom.

It is in the bay that the waves are making land. Some of the little particles of rock from the cliffs are washed into the bay. Others are brought by the river that enters the bay. The waves make a smooth beach of the little grains of sand. It is a beach on which children delight to play.

The grains of sand are not left in quiet. The waves keep turning them over and over. Some of the sand they pile high enough for it to dry out. Then the wind takes hold of it and builds sand dunes.

The sand which the waves pile up along the shore protects the land. They can no longer get at it and tear it down.

THE WAVES MAKE A SMOOTH BEACH.

QUESTIONS.

Mention the different kinds of work the ocean is doing.
Where do the waves work the fastest?
What are the tools of the waves?
What makes the waves?
Where is the waste put that the waves take from the cliffs?
What time of the year is the ocean the most stormy?
Of what is the beach made?
What does the wind do with the sand?
Tell how some of the little islands are made?
What other kinds of islands have you learned about?

THE RIVER MADE THE VALLEY.

HOW THE RIVER MADE THE VALLEY.

The river has much other work to do besides turning water wheels.

The valley in which you live was made by the river. It did this by carrying away little by little the particles of rock and soil along its path. It has taken many years for the river to do the work. It has not finished yet.

Let us look at the river after a heavy rain. The stream is yellow and muddy. It has almost overflowed its banks. Logs are floating by. Near us a tree has tipped into the river. The water has torn away the soil that held its roots.

Where does the river get the mud which makes it so dirty? We will take our umbrellas and go out while it is raining to a little ravine. In summer there is no water here. Now the bottom of the

THE WORK OF THE RILLS.

ravine is covered with a muddy torrent. The torrent is hastening on to add its share to the river.

Upon the sides of the ravine the water is at work. The slopes are just covered with tiny rills. Each rill is as muddy as it can be.

The raindrops when they strike the ground pick up little particles of sand and clay. The clay makes them dirty, but they do not care. The sand they cannot carry easily and so they drag it along the ground. When many drops have united in a rill they are strong enough to carry bigger things. Watch closely and you will see what is happening. The rill is cutting a tiny channel upon the hillside. Many rills are doing the same thing, and if you look about, you will see that the sides of the ravine are all furrowed in this way.

Thus the work of tearing down the land goes on. The torrent in the bottom of the ravine into which the rills are flowing is hastening on to the river. There it will get rid of its load of mud and sand.

It may be that so many creeks full of muddy water will be more than the river can take care of. The river cannot overflow its banks and do much harm when shut in between the hills. But when it reaches the lowland where it is bordered by a broad valley or plain it may form a flood.

At such times the people in the lowlands are afraid of the river. It may spread over their rich farms. Then they will have to leave with their cattle and goods. Perhaps their houses will be washed away.

The river flows more slowly when it spreads out. It cannot any longer carry all the mud and sand which the creeks and rills gave it. When the farmer comes back after the water has gone down he finds that it has left a layer of mud over everything. It is the mud brought by the river that makes the bottom lands so rich.

THE RIVER IS WASHING AWAY ITS BANKS.

The river does not drop all of its load here. It carries much of the finer material into the lake or ocean into which it flows.

The river thus does work in carrying dirt from one place to another. It is washing down the hills and filling up the lowlands.

We have now seen how much work the water can do in one storm. Do you wonder that it has done great things in thousands of years? It has cut cañons so deep that you can hardly see the bottoms of them. It has worn down great mountains higher than any which you have ever seen. It has left only little hills in the place of these great mountains.

QUESTIONS.

Describe the brook or river after a hard rain.

Is the water doing any work?

Describe the work of the raindrops on a hillside.

Where will the soil wash away faster, in a grassy field or a plowed field?

Have you seen sand-bars in the river? Why did the water drop the sand there?

What time of the year is the river doing the most work?

Give the reasons for thinking that the river made the valley.

Where is the land flooded when the river is high?

When a pond of muddy water dries up, what do you find where the water stood?

Where does the river carry the dirt which the rills bring it?

When does the river do the most work, when it runs swiftly or slowly?

What have you seen the water do near your home?

THE SUMMER STREAM.

THE SUMMER STREAM.

Let us visit the river upon a summer day. It is no longer a muddy torrent. In fact the stream is so different that we hardly know it. The clear water ripples gently. We can see the sand and pebbles in the bottom. Little fish are darting here and there.

The river is doing no work now. The summer is its resting time. There are many kinds of pretty pebbles in the water. They are almost as round as marbles and very smooth.

Such interesting stories they can tell. Each little pebble has a different one. They were once pieces of rough rock in the mountains at the head of the river.

One piece fell from a rocky cliff and rolled into a dashing stream. Another piece was picked up by a little boy and thrown into a cañon. A third came from a tunnel where miners were at work. It rolled down the mountain and into a creek.

As winter came the little streams in which the pieces of rock lay were turned into dashing torrents. The pieces were rolled over and over for many days, but when summer came the water went down and they rested for a while.

At last they reached the main river. They were much changed. Their corners were gone and they began to look like pebbles. Year after year the pieces of rock became smoother, and one summer they were dropped where you saw them. Another winter they will again be moving down the river, rolling and tumbling along in the muddy water.

Place some bits of rocks in a dish and shake it for a few moments. You will find that the corners of the pieces have been rubbed off a little and that there is dust in the bottom.

Why is the river water so clear in the summer? We can find out by following the river to its head,

The river divides into many little streams. At the head of each there are clear springs.

MORNING EAGLE FALLS IN GLACIER NATIONAL PARK
(Copyright, 1912, by Kiser Photo Co., for Great Northern R. R.)

Spring water has come a long journey through the ground. It has lost all the mud which it had

when on the top of the ground. The spring is filtered rain water. If you turn muddy water into a filter it comes out clear. In the filter there is either sand or rock full of tiny holes. Passing through these the water loses its mud.

The river is muddy in the winter time, for then it gets the most of its water from the top of the ground. You know kow dirty the ground is.

In some countries the rivers disappear in the summer. The thirsty air keeps taking the water as long as there is any in sight. If the river bed is sandy a part of the water escapes. It creeps in among the sand grains away from the sun and air. People obtain water from such a river by digging holes in the sand.

QUESTIONS.

Describe the difference between the summer and winter stream.

How were the pebbles made?

What did the river do with the material it ground from the pieces of rock?

What is sand made from? Tell how it is made.

Why is the water of the river clear in the summer time?

What makes some creeks dry up in the summer?

What is a filter?

How do the springs act like filters?

Tell how the bed of a dry creek looks.

WHAT IS CLIMATE?

The climate of a place is the kind of weather which it has. If it rains much in a place we say the climate of that place is wet.

If the sun shines the most of the time and little rain falls, we say the place has a warm, dry climate. Nearly every place has a different climate. At my home it rains in the winter, and the summers are long and dry. Where you live it may snow or rain every month in the year.

Many things work together to make the climate of a place. The sun, the winds, and the clouds are all striving with each other. The weather yesterday is not like the weather to-day. Winter is not like summer, nor spring like fall.

Summer is warmer than winter, because in the summer we get more sunshine. In the south it is warm nearly all of the year. In the far north there is little sunshine and it is cold the most of the year.

You will learn in the next lesson how the climate changes as you go up the side of a mountain. On the top of the mountain it is much colder than in the valleys below. At the foot of the mountain it may

be warm enough for oranges, while at the top there is snow the whole year through.

The sun warms the land quickly. The heat of the ocean changes but little from winter to summer. The winds which blow from the ocean are cool. For this reason people who live near the ocean have a pleasant summer climate.

In the summer the winds which blow over the land become warm. Upon the great plains these winds are so hot as to almost burn your face.

It generally rains more near the ocean than it does far away. Mountain ranges have more rain than lowlands for their cool tops turn the clouds into rain. A country which has a high mountain range between it and the ocean gets very little rain. The mountain has taken the most of the moisture from the air.

A place where but little rain falls through the year is called a desert. The desert has strange looking plants which can live a long time without water.

The climate of a place determines what kind of plants can grow there. The climate also affects the animals. There are some places upon the earth where people cannot live because of the bad climate.

The kind of work which people carry on is partly determined by the climate. Everywhere you go you will find people raising different kinds of

products and doing different things. Oranges can grow only in a warm climate. We get apples and grain in cool climates.

In wet countries the forests are often so dense that you cannot go through them without having a path cut. In the desert there is little in sight besides sand and rocks.

The animals of the south have little fur. They are dressed by nature for the warm climate in which they live. In cold countries their fur is thick and long.

In cold climates we need meat to eat. Where it is warm fruits and vegetables are better for us. In every place people raise what will grow best in that place. The different climates give us a great variety of food.

If the climate were the same everywhere our world would not be as pleasant as it is.

GRINNELL MOUNTAIN FROM LAKE McDERMOTT, GLACIER NATIONAL PARK, MONTANA.

QUESTIONS.

Are the days cooler upon a hill or in a valley?

Why are the nights cooler?

Where does frost come first in the fall?

From which direction do the winds blow that bring rain?

Where do you think it is warmer in the winter, near the ocean or far away from it? Why?

Mention the different things which make the climate of your home.

Do ponds and lakes freeze over in the winter where you live?

Does the ocean freeze?

What is a desert?

What time of the year does it storm most?

How do people keep warm where it is cold?

What do you eat that is raised in a warm climate?

WHAT WE LEARNED BY CLIMBING A MOUNTAIN.

Mountains are higher than hills. We might call a mountain a grown-up hill. Mountains are also rougher than hills. They have rugged cliffs and deeper cañons.

We climbed a high mountain once. Would you like to know what we saw?

We started from the valley where the land is smooth and the river flows slowly. All the land was covered with grain-fields and orchards. The people there are farmers.

As we traveled in the direction of the mountains the valley became narrower and the land not so smooth. We soon got among the foothills. These are little hills at the foot of the mountains.

We left the grain-fields behind, but there were still many orchards to be seen. After a time the hills became too rough and steep for the orchards and we saw about us herds of cattle feeding. Cattle can find something to eat where the land is too rough for the farmer.

The river now flowed in a narrow valley or

cañon. At one point there was a pretty waterfall. The river tumbled over a ledge of rock with a loud noise. The river has been at work for a long time digging the cañon in which it flows. Where the waterfall is, it found some very hard rock, so it jumped over the rock instead of cutting it away.

As we went up the mountain we found that the climate changed. We seemed in a strange country for everything was different. In the valley the spring flowers had gone. Here they were thick on every side and there were many which we had never seen before. The days and nights were cooler. It seemed like spring. In truth it was spring, for winter lasts longer and

spring comes later in the mountains than it does in the valleys.

The trees as well as the plants interested us. There were pines and firs that filled the air with a pleasant odor. Where the rough bark was broken we found the resinous sap. How sticky it was. That which had become dried made good chewing gum.

We passed by a mine where the men were digging deep in the rocks for gold. We saw the ore come up out of the mine and go to the stamp mill. Thump, thump, thump! went the iron stamps as they crushed the rocks and set free the gold.

By and by we came to a clear lake. There were forests and rocks around it. The water was so quiet that we could see everything on the shore reflected in it. We learned much from the lake, but you will hear about it in another chapter.

Up we went, for we were still far from the top of the mountains. After a time the trees became smaller and at last we stood upon the bare, rocky slopes. Mosses grew upon many of the rocks and in warm nooks there were low bushes. The air was cooler than in the little valleys and along the brooks the spring grass had hardly begun to grow.

You would hardly have thought it was the month of July, for snowbanks lay here and there on

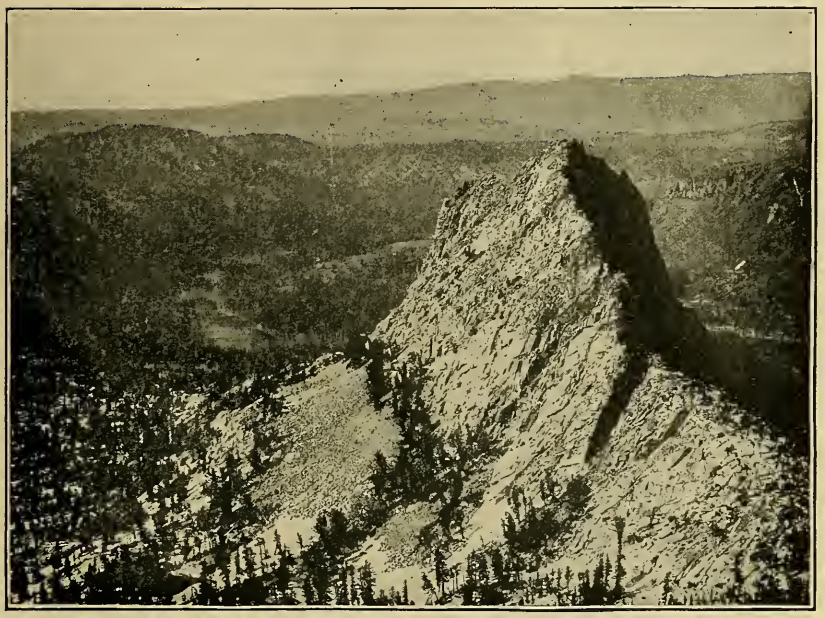
the shady slopes. How strange to be able to play snowball in summer! How long and cold the winter must be there!

The climate there is much like that in the far north. The plants and animals that live there are

THE WATER WAS SO QUIET.

similar to those of the north. In climbing the mountain we passed through regions of different climate and productions just as we would do in going from our own home toward the cold north. Does not this seem very strange to you?

At last we stood upon the summit of the mountains. It is so cold and barren there that nothing can grow. We were very tired, but the view which we got over many miles of country interested us for



THE MOUNTAIN SLOPED DOWN LIKE THE ROOF OF A HOUSE.

a long time. We played that it was a great map, and we enjoyed studying it much more than those in the geography.

The mountain slopes down like the roof of a house. We stood as it were on the ridge of the roof.

On the side of the mountain up which we

had climbed, the water from the melting snow and the springs, after a long journey, goes down past our valley home. Upon the other side of the ridge, or summit of the mountain, the water flows down through another valley far away from ours.

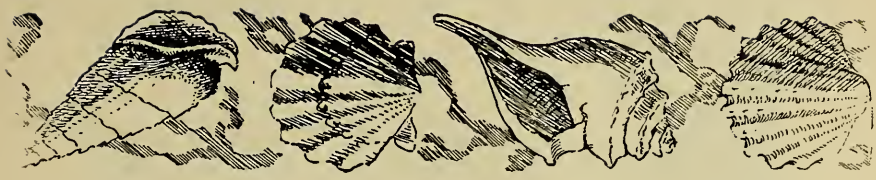
We stood with one foot upon one slope, and one upon the other. The raindrops falling there start away in different directions.

How different their stories will be when they once more reach the ocean. They may never be near each other again.

The ridge on which we stand is called a divide, because it makes the water flow in opposite directions.

QUESTIONS.

How are mountains different from hills?
What occupations do people follow in the valley?
What kinds of work are carried on in the mountains?
What is a waterfall?
Of what use are waterfalls?
Tell some of the ways in which pine trees differ from other trees.
Of what use to us is the sap of the pine?
Where does snow stay the longest?
Where is it cooler on a summer day, in a valley or on a hill?
Find a divide near your home and describe it.
How is the divide like the roof of a house?
How is going up a mountain like going toward the north?
Why do different plants grow at different heights on the mountain?
What climate do you like best?
Would you rather live in the valley or on the mountain? Why?



THE WANDERER.

Upon the mountain's height, far from the sea,
I found a shell,
And to my curious ear this lonely thing
Ever a song of ocean seemed to sing —
Ever a tale of ocean seemed to tell.

How came this shell upon the mountain height?
Ah, who can say
Whether there dropped by some too careless hand —
Whether there cast when oceans swept the land
Ere the Eternal had ordained the day?

Strange, was it not? Far from its native sea,
One song it sang —
Sang of the mighty mysteries of the tide —
Sang of the awful vast, profound and wide —
Softly with echoes of the ocean rang.

And as the shell upon the mountain's height
Sings of the sea,
So do I ever, leagues and leagues away —
So do I ever, wandering where I may,
Sing, O my home — sing, O my home, of thee.

— *Helena Modjeska.*

MT. WILBUR FROM THE SHORE OF LAKE McDERMOTT, GLACIER NATIONAL PARK, MONTANA.

STORY OF A MOUNTAIN.

Before us rises a high mountain. Its top is white with snow. Its sides are steep and rocky and very hard to climb. What made the mountain? Has it always been there, or is it a little hill grown large and high?

Mountains really do grow. Is that not strange? They were once lower than they are now. They began as little hills long ago and slowly kept getting larger. When mountains stop growing they do not remain always. They are wearing away, and after a long time may change to little hills again. Let us see if we can understand how this is done. A mountain will interest us more when we know its story.

Some mountains are formed by the rising of the solid land on which we live. The land wrinkles in furrows and ridges. You can see how this is done by taking a piece of paper in your hands: when the paper is stretched out it is even like a plain; shove the opposite edges of the paper toward each other and it will wrinkle. There will be a ridge, and then a hollow, and then a ridge again.

At first the ridges upon the earth where mountains are forming are not higher than hills, but they keep rising and rising until they reach, it may be, two or three miles into the sky.

You can not see mountains grow, because they do so very slowly. You would have to watch many thousands of years to see one change a great deal.

You have all heard of earthquakes, I am sure. At such a time the land trembles under our feet. The strongest buildings are sometimes thrown down. In places where mountains are growing we often have earthquakes. In the western part of our country we can see places where the land has changed its level fifty feet at the time of an earthquake.

The mountain which rises so white in our picture is a volcano. It is one of the highest mountains in the United States and is called Mount Shasta. Volcanoes are formed in a different manner from other mountains.

Have you ever heard what volcanoes are made of, and how they have buried whole cities? In Italy there is a volcano that buried two cities for so long a time, that people living near forgot that the cities had ever been there.

Volcanoes are built of lava and ashes which are thrown out of an opening in the earth. Far down beneath our feet the rocks are very hot. In some places they are hot enough to melt. If there is any water in them it is changed to steam. The steam tries to get out just as it tries to escape from the boiler of an engine. Where it finds a weak place in the crust of the earth it makes a hole. Around this opening a volcano may be built up. Melted rock, pieces of solid rock, and ashes are blown out through the opening. After a time enough accumulates to form a mountain.

If you can visit a furnace you may see melted iron which looks much like hot lava from a volcano. The clinkers from a coal fire look like the lava when it has become cold.

We have seen how the river is at work making the valley in which it flows. We have seen that mountains are furrowed with gulches and cañons made by the raindrops. The muddy streamlets after a rain are carrying the land away from the mountain sides.

Do you not think that after a long time many streamlets could wash the mountain entirely away? If you should work long enough you could carry away a haystack by taking one straw at a time.

GOING-TO-THE-SUN MOUNTAIN, GLACIER NATIONAL PARK, MONTANA.

The snowy mountain which our picture shows will not last always. Every spring when the snow melts the streamlets are working as fast as they can carrying the particles of soil and rock down to the valley. Some time the mountain may be worn down and only a hill left in its place.

SOMETHING ABOUT LAKES.

You remember that in going up a mountain we passed a pretty lake. Would you not like to know something more about lakes?

You have all seen ponds left by the rain in hollows of the land. Some of the boys have built rafts and paddled about on these ponds.

A lake is much like a pond only that it is larger. Different lakes have different stories to tell. All these stories are interesting and we will listen to some of them.

Our mountain lake was formed in a river valley. Below the valley the river flowed through a cañon with steep, high walls. The falling rain soaked into the cracks on the rocky bank until by and by the rocks were made so loose that they were ready to fall. One wet winter the whole hillside slid down and blocked the river. A great mass of rocks and dirt filled up the whole cañon.

The river kept flowing into the valley above and soon a large lake filled it. When the water of the lake reached the top of the dam the river flowed on again. It tumbled over the dam and

went dashing down the cañon as if nothing had happened.

After a time the lake became very pretty. Willows and grasses grew about its shores, and many water animals came to make their homes there.

THE MEADOW TAKING THE PLACE OF THE LAKE.

But the river was not idle. You know how it works a part of the year. It kept bringing down mud, and sand, and pebbles and had no place to leave them but in the lake. The upper end of the lake where the river flowed in began to fill up. At

last a marsh took the place of this part of the lake, and then dry land covered with grasses. The land formed in this way we call a delta.

The lake will after a time disappear and a beautiful meadow fill the whole valley.

THE DELTA OF A RIVER.

There are other kinds of lakes besides the one we have just learned about. The water in our mountain lake is fresh, and good to drink, because it has an outlet. There are lakes with no outlets

and these are often very salty. Besides the mud and sand which the streams bring into the lakes there is a small amount of salt, soda, and other minerals. After a time the water becomes so salty that it is not fit to drink. In some places they make salt and soda from the water of such lakes.

Lakes are very pretty and many people camp by them in the summer. They are also useful, because they store the water of the winter storms which would otherwise run away to the ocean.

QUESTIONS.

Tell what a pond is.

Have you ever seen a lake? If so, describe it.

Have you seen a land-slide after a heavy rain? Tell what happened.

Why did the river leave its load in the lake?

Of what value are lakes?

Why is the water salty in some lakes?

What is a meadow?

How does the ocean differ from a lake?

What is a delta?

Is the land formed by deposit from a river rich or poor?

A QUARRY.

WHAT ROCKS ARE MADE OF.

We have learned that soil is made from rock. Now we ought to learn something about rocks themselves. Rocks are very useful in many ways. It is in the rocks that we find gold and other minerals.

We have seen rocks in many places. In the hills and mountains they are sticking out of the ground. Along the ocean shore and in the cañons the waters have washed the soil away and left them bare.

Do you know what a quarry is? It is a place where rock is obtained for buildings. The rock which we find on the top of the ground is dirty and often crumbles easily. It is changing to soil. To get clean, hard rock men open a quarry.

To do this they first scrape away the soil. Then they use powder and blast the rock out until they get down where it is fresh. Then care is used, in breaking the rock, to get pieces of the right size. After the rock is broken hammers and chisels are used by the men, to shape the pieces as they wish.

Many kinds of rock are used for buildings. Granite will be the most interesting to us, and so we will study a chip of that rock.

Here is a piece of granite just from the quarry. I am sure that we have all seen granite. The piece is speckled with little grains of different color. Let us see what these grains are.

Here is one that is clear and looks like a piece of glass. It is so hard that you cannot scratch it with a knife. This mineral is called quartz.

There are also some little black grains in our chip of granite. If we examine them carefully we find that they can be split into thin scales which are elastic. This mineral is mica.

There is another mineral in granite. It has a light color, but is not glassy like the quartz. It

shows bright shining faces. This mineral is called feldspar.

Take a hammer and pound a piece of granite until you have a fine powder. Wash away the dust and mica scales and you will have some clean white sand like that upon the beach.

Nature is breaking the rocks in pieces, but she works quite differently. She takes a long time to make a piece of granite crumble to sand.

The sand which you find by the water's edge is mostly grains of quartz. Quartz is used for making glass.

You will find mica in the brooks in the summer time. When the water is clear you can see the shining mica scales moving along the bottom with the current. They look like gold.

Scales of mica are used to make the windows of stoves. These scales are very much larger than those found in granite. Can you think why glass would not do for stove windows?

The feldspar in granite finally turns to clay. It is clay that sticks to our feet when it rains. Our china dishes are made from clay.

Bricks are made from sand and clay mixed.

When grains of sand become cemented so as to stick tightly together they form a kind of rock called sandstone. This rock is also used for buildings.

Limestone is still another kind of rock. You can tell limestone because it is quite soft, and when you put drops of an acid upon it little bubbles quickly form. Marble is one kind of limestone. It is used for statues.

QUESTIONS.

Tell some of the ways in which rocks are useful to us.

Why do men dig deep in the earth to get rock for buildings?

How is the soil made from rock?

Where have you seen rock?

Can you tell how men quarry rock?

Mention some of the uses of glass.

What uses are made of marble?

Can you tell what mortar is made of?

What part of granite makes clay? Give some of the uses of clay.

Can you tell us something about mica?

Tell us about the different kinds of rock used for buildings.

Which is the prettiest?

Which is the softest?

How can you tell quartz when you examine a piece of granite?

VIRGINIA CITY.

WHERE MINERALS ARE FOUND.

What minerals have you seen? Let us think. There is iron, which is used to make our stoves. Tin is used to coat many of our dishes. Copper is used in making wire and in many other ways. Gold and silver are used for money. They are also used in making dishes and jewelry.

There are so many different minerals. Where do you suppose they are all found? We cannot go out in the hills and pick these minerals up in the form in which we see them. They are rough and dirty, and mixed with rock when first found. They

have to go through many processes before they come out pure and bright.

If you were hunting for gold or silver, would you look in the valleys where grain and fruit are raised or would you go into the mountains?

Minerals come out of the earth, but they are not often found in the soil. We would not be apt to find them in the garden or grain-field. Minerals come from the hard rocks in the mountains.

In the valleys the rocks are buried deeply by the soil. In the mountains the rain has washed the soil away from the rocks, leaving them quite bare in many places. This is where we should go to hunt for minerals.

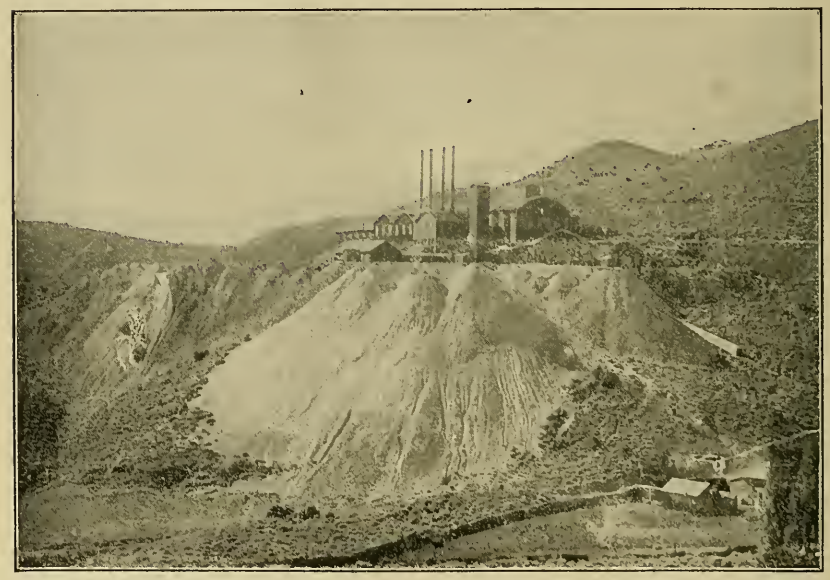
Here is a man who can tell us something about minerals. He has spent many years hunting for them, and digging among the rocks. He is called a miner.

He says that minerals are found in thin layers in the rocks. These layers or veins reach ever so deeply into the earth. Hundreds and hundreds of feet the miner digs down through the rocks as he follows a little vein of ore. He gets far from the light of day and has to use a candle to work by.

The holes which the miner digs are called shafts. They appear very much like wells. The miners ride up and down in what is called a cage. The cage

looks like the elevators which are found in tall buildings in cities.

Mining is dangerous work. Sometimes the miners do not have good air to breathe. They are often hurt by falling rocks or by powder explosions.



A GOLD MINE.

Some mines have been dug nearly a mile deep. Would it not seem strange to ride down nearly a mile into the solid earth? The deep mines are often very hot. The men can stay in some of them only a little while at a time.

There is much water in most deep mines. We

have learned that there are little underground streams running through the cracks in the rocks. The shafts and tunnels cut some of these, and this is the reason the mines are so wet.

It is hard and dangerous work to get the shining yellow gold. Men go all over the world hunting for it. What an interesting story gold might tell us — a story of how it was buried deep in the earth ever so long ago, and how the miners found it and brought it to the surface.

To get the gold from the rock sticking to it the ore is put in a mill. The mill is a noisy place with heavy stamps of iron rising and falling all of the time. The stamps crush the rock and set the gold free. At last it comes out clean and bright.

Most of the mines are found in mountainous countries. If you will look upon the map of your country or state you can tell where the mines are. You can imagine that in each mountain range which you see pictured upon the map there are hundreds of little holes. You can imagine also that these little holes are full of busy men. They are going in and out of the holes like so many ants, digging long underground passages and bringing the rock to the surface.

QUESTIONS.

Mention the different minerals which you have seen.

Which is the most valuable?

Which is the heaviest?

If there are mines near your home, tell what you have seen men doing there.

If you were looking for minerals where would you go? Why?

Are there minerals underneath the soil of the valleys?

Why do not men mine in the valleys?

In what way is mining dangerous?

What is the most useful mineral?

Why are some mines hot?

How deep have men been in the earth?

Give some of the qualities of gold.

THE INHABITANTS OF THE WATER.

The water is full of living things. Watch the water of some quiet pond and you will see many sorts of animals. They are moving about looking for something to eat.

The most of the animals that you find in the water spend all of their lives there. Some of them are fitted to live upon the land also. These go back and forth as they please.

The land animals have legs for walking and lungs for breathing air. The water animals swim, or float, or creep upon the bottom. Some remain fastened in one place the whole of their lives like plants. Instead of lungs they have gills for breathing water.

We find many kinds of plants growing in the water. Those in the shallow ponds and lakes, whose roots reach into the mud and whose leaves and flowers are found upon the surface of the water, were once land plants.

Besides these we find another class of plants called algæ or seaweeds. These are very different from the plants which we have just mentioned. Their home has always been in the water.

Some of them float in the water while others grow fastened to the bottom. They have no real roots, but take their food from the water by means of their leaves.

If you could take a walk upon the bottom of the ocean it would seem like fairyland. Everything would be so strange and interesting.

We should see waving seaweeds of many colors, and upon the bottom beautiful shells and delicate corals; little crabs of curious shape would run up and down the seaweeds or hide among their leaves. Some have little seaweeds growing upon their backs.

We should see many fish and other animals, some very large and fearful to look at.

Nearly all the fish that you find in the ocean die if placed in fresh water. The grandfathers of the fish which you catch in the brooks and lakes lived in the ocean a long time ago. Their children

while hunting for food slowly became used to breathing fresh water. So at last they left the ocean and went up the rivers to live. They found food which they liked in the rivers and they did as you will learn plants have done. They adapted themselves to all kinds of places. These fishes have lived in fresh water so long that now salt water will kill them.

You have all heard of the salmon. It can live

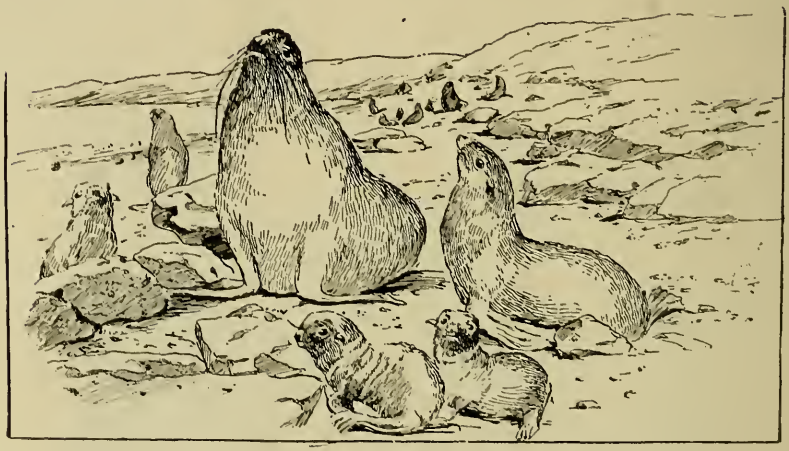
PREPARING FOR THE OPENING OF THE FISHING SEASON IN THE COLUMBIA RIVER, NEAR ASTORIA, OREGON

in both fresh and salt water. This fish spends the most of its time in the ocean. When its eggs are ready to be laid it seeks a stream of fresh water.

For days the streams along the north Pacific ocean are filled with salmon. They are crowding

and pushing their way up stream. Those that are not killed at last reach the clear cold brooks in the mountains and there lay their eggs.

Seals and whales are among the most interesting of the ocean animals. They are not fish, for they have to come to the surface of the water to breathe air.



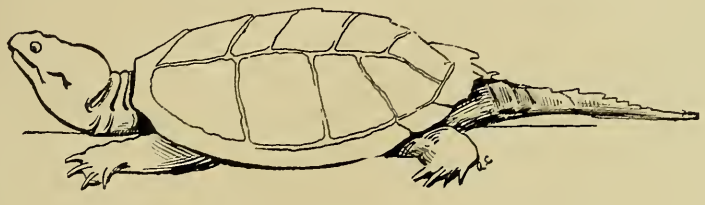
THE FUR SEAL.

What a strange story these animals can tell! Their grandfathers lived upon the land ever so long ago. They had four legs and walked around like other animals.

They used to go into the water for food and at last spent the most of their time there. Their bodies and legs became changed so that they could swim or paddle through the water. Now they are

at home in the water and very quick and graceful in their movements. Have you ever seen a seal out of water and noticed how awkward it is? The beautiful fur coat of the seal is like the coats its grandfathers wore when they lived upon the land. The face of the seal is very different from that of the fish. It is much more intelligent.

If you live near the ocean you have enjoyed playing along the shore at low tide. What have you discovered about the inhabitants of the ocean?



QUESTIONS.

How do water animals differ from land animals?

Do you know any animals that spend a part of their time in the water and part on the land?

How do animals move through the water?

How does the covering of fish differ from that of seals?

Mention some of the fish that are found in fresh water.

Mention the different kinds of water animals that you know.

Tell what you know about the salmon.

Why did the fish in the ocean go into fresh water?

Mention diffierent kinds of water animals that are used for food.

What water animals swim?

What water animals stay in one place?

THE SPROUTING SEED.

Here is a horse-chestnut. How smooth and bright it is! Upon the outside there is a hard, brown shell. The white substance within looks much like the meat of a chestnut.

We will partly cover one of the nuts in moist soil, and water it often. We may learn something interesting.

You know that the tree grows from the little seed. Do you suppose there is a tiny plant wrapped up in the horse-chestnut? If there is one, it must be asleep. Perhaps the warm, moist soil will wake it up.

Very soon the nut begins to swell. It is taking in water from the soil. Upon one side of the nut there are two little hollows coming together like the letter V. As the swelling goes on, the part of the shell within the V begins to split away from the rest of the shell.

It takes several days for this to happen, but at last we can see why it is. There in the opening appears a slender shoot. It is splitting the shell apart and forcing its way out.

There must be something within the nut waking to life, for day by day the little stem reaches farther out. The stem is turning down also as if it were trying to reach the soil.

The nut has swollen so much now that it has split the shell. Within we can see the white meat of the nut. It splits easily into two parts. The little stem which is pushing its way out is also splitting.

Between the two halves of the stem we now get sight of something new. It is the most wonderful of all. There are some little leaves unfolding. In a few days more they have opened. They are very delicate and tender, but just like the leaves of the horse-chestnut tree from which the nut came.

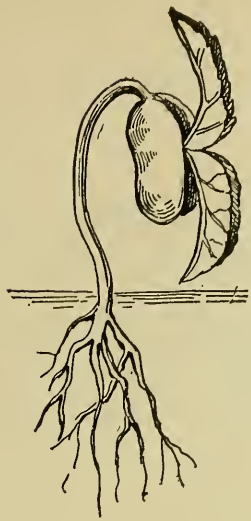
The end of the little stem has reached the ground and is pushing down into it. The stem is to be the root of the little plant. Branching rootlets are already starting from it.

But how can the plant grow before it has any roots? It is being fed from the white material within the nut. This is mostly starch. It is just what the little plant needs before it can shift for itself. The two halves of the nut which we have discovered are the seed leaves. After a time the plant will use up all of the food stored in them.

They will be of no more use and will shrivel and die.

By this time the little root has gone far down into the ground. The branching rootlets are growing. The leaves are now large enough to help. There are more of them and they are reaching up into the air. The roots take the food from the soil. This food passes up through the stem to the leaves. The sun shines upon the leaves and changes the food in such a way that the plant can use it.

A tiny plant lay ready formed in the seed or nut. It was the germ or embryo. Warmth and moisture were all that was needed to wake it into life. It will grow year after year and at last become a tree. Then you will find upon it in the spring long clusters of flowers, and in the fall the pretty red-brown nuts like the one you have studied.



QUESTIONS.

Plant some beans and see if they behave as did the horse-chestnut.

What is the use of the hard shell on the horse-chestnut?

Mention some other seeds which have a shell on them. What are nuts?

Can you tell where the water soaks into the horse-chestnuts?

Of what use is the meat in nuts? What nuts have you eaten?

What would happen if the little stem which pushes out of the shell did not get down into the soil?

What are the two halves of the nut called?

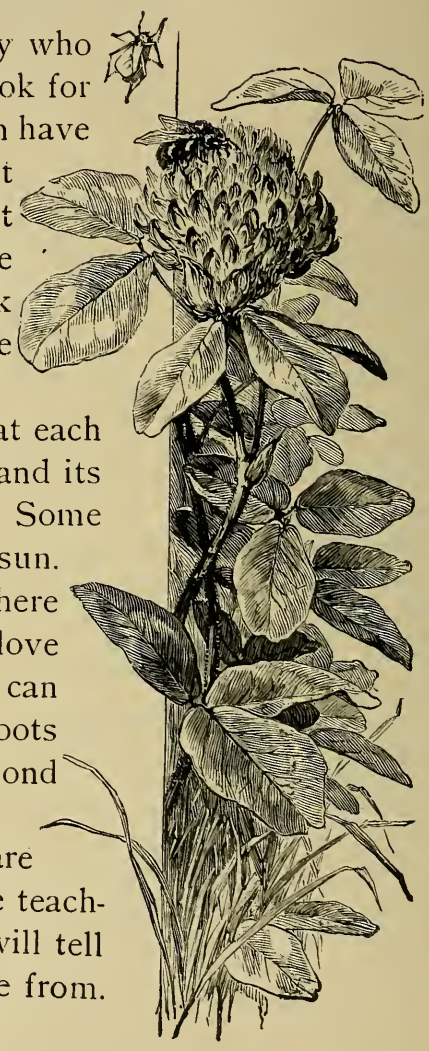
Could you see the plant in the nut before it was put in the moist ground?

Do nuts have a covering? Are any of the coverings of nuts prickly?

What is it that makes the little leaves turn green?

Would the little plant grow without any sunlight?

WHERE THE FLOWERS GROW.



Is there a girl or boy who does not know where to look for the wild flowers? Children have bright eyes. They did not learn from books, but Nature taught them. She showed them where to look in the meadow, and by the brook.

They have found that each flower has its own home and its own time for blossoming. Some plants love the bright sun. Others hide away where there is always shade. Some love the dry hillsides. Some can live only where their roots reach the water of the pond or brook.

Day after day there are beautiful flowers upon the teacher's desk. The children will tell you where each kind came from.

The buttercup, the orange poppy, and the yellow violet came from the meadow. The prettiest flower of them all is the butterfly lily. It came from a dry

hillside where you would hardly think anything could grow.

The purple trillium grew in the shady woods. It is one of the earliest of the spring flowers. The

marsh marigold and Jack-in-the-pulpit are dwellers in wet places. The grasses and cat-tails came from the quiet pond.

FRINGED GENTIAN.

The pond lily loves the still water of the pond or river. Its great leaves and beautiful flowers cover the water. Pond lilies are hard to get without a raft or boat, but we prize them the more for this.

Study some of the little flower buds and you will see how delicately the petals are wrapped. Some flowers unfold with the morning sun, others wait until evening.

The plant loves its home just as you do yours. Away from its home the plant does not grow well. It is not happy.

How do you suppose there came to be so many different plants, each kind having a place of its own in which it loves to grow?

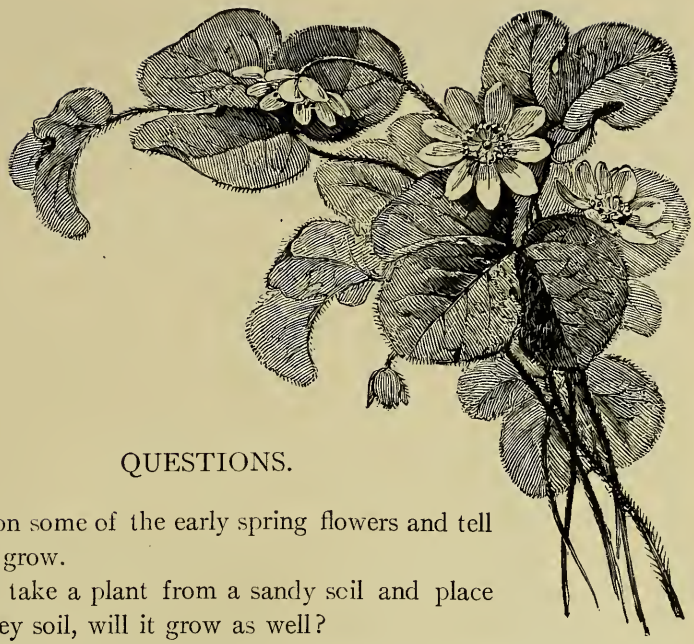
I will tell you the reason. I am sure you can understand it. We have already found that plants want good soil, water, and light. Wherever it rains we find the ground covered with little plants. Each is struggling to get sunshine and food. There is not room enough for all of them in the best places. Many are crowded out and have to live where the ground is dry and barren. Some, like the pond lily, are crowded into the water.

At first this was pretty hard for them and ever so many died. After a long time, however, the plants became used to their different homes. They became so contented that they wanted to stay where they were. They would not be happy if they had to go back to their old homes.

Out on the meadow you can see how the plants are still crowding each other. Each plant is striving

to get all the sunshine, and plenty of room for its tiny roots. The plants next to it are doing the same thing. The strongest succeed, but the weak ones finally droop and die. Some time you will want to know more about how plants as well as animals are struggling. It is a strange story.

The flowers in our gardens once grew wild. Our grandfathers dug them up and set them in gardens. They tended these plants very carefully for years, giving them plenty of water and soft rich earth for their roots. This made the flowers larger and more beautiful. The many kinds of roses have grown from the wild rose of the woods.



QUESTIONS.

Mention some of the early spring flowers and tell where they grow.

If you take a plant from a sandy soil and place it in a clayey soil, will it grow as well?

Will a plant from a dry country grow well where it is very wet?

Are there any places where you do not find plants growing?

What are the little plants struggling for?

Of what use are the flowers upon the plants?

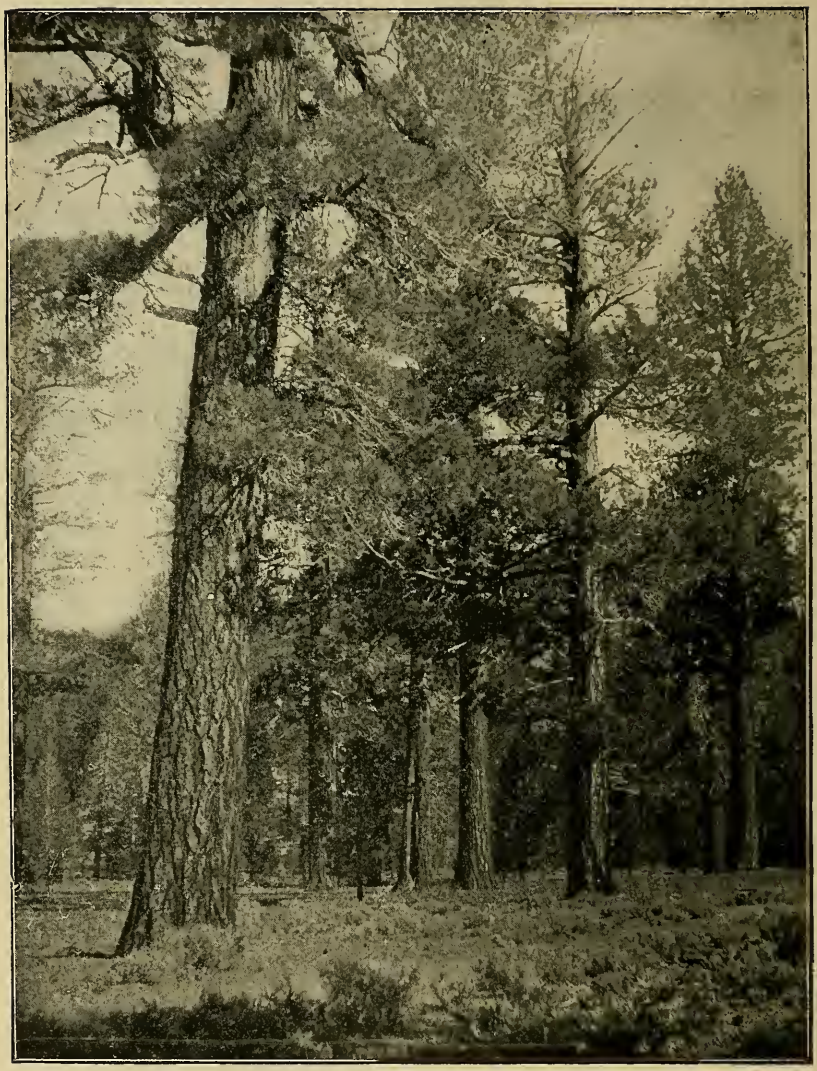
What is necessary to make the little seed sprout?

How do some plants scatter their seeds? Does the wind help?

Tell how our garden plants were obtained.

What plant turns its blossoms toward the sun?

How do some plants hold themselves against walls?



PINE FOREST.

THE BIG TREES OF CALIFORNIA.

SOME COMMON TREES.

We could not do without the trees. Not only are they very useful, but they help make the world a beautiful home for us.

Trees furnish us food in the shape of fruit and nuts. Their trunks are made into lumber for our houses. Paper is made from certain kinds, and the bark of others is of great value for tanning leather and in the manufacture of cork.

Where the trees are thick they form a forest. Many animals make their homes in the forests, and birds build their nests there.

How we enjoy the shade of the trees on a

warm day! The cattle and sheep are also found there contentedly chewing their cuds.

There are many reasons why we should preserve the trees. They protect the ground from the

WHITE OAK.

hot sun. The leaves and moss which are found under them hold the rain-water so that it does not run away so quickly. Where there is no vegetation the water runs rapidly away, cutting little gullies and carrying off the soil.

Trees which keep their leaves through the year are said to be evergreen. The pines and firs and cedars, as well as the live oak, are evergreen. How fragrant a forest of such trees is!

LIVE OAK.

The pine loves the sandy soil and the rocky mountain slopes. From the sap of the pine we get resin and turpentine.

Most trees drop their leaves in the fall. At the base of the leaf stem there is a little bud. It is well wrapped up and protected from the wet and cold. The warm sun of spring makes the buds begin to

swell. Soon they burst their wrappings and the bare trees are covered with green again.

Trees are suited to different places. This came about just as you remember I told you it did with

COTTONWOOD.

the flowers. The willow loves the wet places. It does not care much where it grows if only it has plenty of water. Wherever you find willows growing you may be sure there is water.

In the northern woods there are the birch and maple. The bark of the birch is used by the Indians

ELM.

for making canoes. The maple is an old friend. You have heard how maple sugar is made from its sap.

How many have seen a cottonwood tree? We find this tree in dry countries. It grows close to the streams. It is called cottonwood because of the downy tuft upon the seed.

Do you have any oak trees near your home? There are many kinds of oaks. One is always green and so we call it live oak.

The fruit trees of our gardens were once wild. Did you ever find apple trees in the woods? Their apples are small and sour. Apple trees have been grown in gardens for many years. This has made the apples larger and more pleasant to the taste.

The nut trees are a great attraction in the fall. Children who have never been nutting do not know what fun it is.

QUESTIONS.

Mention some of the trees that drop their leaves in the fall.

What trees have leaves all of the time?

Describe the leaves of the pine.

In what kind of a covering do the seeds of the pine grow?

Mention some trees that grow upon dry ground. Some that grow upon wet ground.

Do you know any of the trees that grow in warm regions?

What kinds of trees make the best wood for our fires?

Name as many as you can of the nut trees.

Name a number of fruit trees. Of what use are trees? What is a forest? How do forests protect the soil? What effect has the rain upon countries where there is little vegetation covering the ground?

MEADOWLARK.
Reduced from large four-color illustrations of the Audubon Society bird pictures.

SOMETHING ABOUT THE BIRDS.

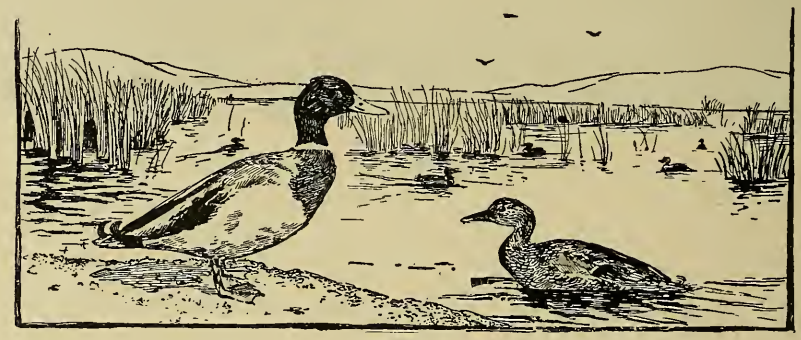
If birds could talk what stories we might hear. We might learn of a time, ever so long ago, when their grandfathers were not birds at all. Then they could not fly, for they had neither wings nor feathers. These grandfathers of our birds had four legs, a long tail and jaws with teeth. After a time feathers grew upon their bodies and their front legs became changed for flying. These were strange looking creatures. There are none living like them now.

All about us now are the pretty birds. They wake us in the morning with their music. We think sometimes that they eat too much of our fruit,

but then, if there were no birds to kill the worms upon the trees we might have less fruit still.

Each kind of bird is fitted for the place in which we find it. Some birds are fitted for life upon the water. Others do not fly much, but spend their time upon the ground, while still others are on the wing much of the time and have their nests in tall trees.

The duck lives upon the water. It has strong legs and feet with webs between the toes for paddling.



DUCK.

The stork is a wading bird, hunting for its food in shallow ponds. It has long legs which fit it for wading. In the water it finds insects and little fish, the kinds of food which it loves best.

The hawk has very sharp eyes. As it sails through the sky it is on the watch for a mouse or perhaps a tender chicken. It has sharp talons for catching and holding its food.

How delicate are the feet and legs of the robin. They are so small that it seems as if they could hardly hold up the body of the bird. The robin does but little walking. That is the reason his legs are so small.

OSTRICH.

The ostrich has such small wings that it cannot fly. This bird has, however, very large legs with which it can run rapidly over the ground.

Each kind of bird builds a different nest, and

has a place of its own for its nest. The humming bird builds one of the softest down, upon a swinging branch. The swallow builds its nest of mud, under some protecting roof or rocky cliff. Some birds take no pains with their nests. They gather a few sticks and leaves for a rude nest, or even lay their eggs in some hollow in the rocks.

We should not wantonly kill the birds and rob their nests. The birds are happy in their lives as you are in yours. They make us happy, too, with their songs, and eat many worms and insects which injure our fruit.

QUESTIONS.

Tell how birds differ from other animals.

What birds are used for food?

What birds have been domesticated? What are the names of some of these birds?

What bird is used to carry letters?

Mention some common kinds of fowl.

Do you suppose our hens used to be able to fly long distances?

Do tame ducks fly much?

Do you know any birds that make their nests on the ground?

Why do many birds make their nests in trees?

Name some of the song birds.

Where does the woodpecker get his food?

Is the bat a bird?

Mention some water birds.

Why do birds go north in the spring and south in the fall?

YOUNG VIRGINIA DEER.

SOMETHING ABOUT THE WILD ANIMALS.

Animals are not at all like plants. The plant spends its whole life in the spot where it sprouted from the seed. Its roots hold it firmly in one place. The soil may be poor and the leaves of the plant may get little sunshine, but it cannot help itself.

Animals go from one place to another for their food. They live where they can find plenty to eat and are well protected from their enemies.

Plants take their food in through their roots. They breathe by means of their leaves. Animals have a mouth for eating. They breathe with lungs.

Some of the animals get their food from plants.

Such animals have flat teeth for grinding this food. Many animals live upon those animals which they can catch and kill. They have sharp teeth for tearing flesh.

YOUNG DEER.

If you study the animals you will find that each one is fitted for the place in which you find it. There is a struggle among animals for food just as there is among plants. The weaker animals choose their homes where they can be safest from the attacks of the stronger ones. Because of these things many

animals have come to live in the ground, and others in the trees.

The little mole, who spends all of his time in the ground, has a nose for digging in the dirt. It is dark there and he has no use for his eyes. Now he

FOX.

is almost blind, but his grandfathers a long time ago lived upon the top of the ground and had as good eyes as any animal.

The coyote lives in the open plain or hilly country. He has use for sharp eyes and ears and long, slender legs. He has a sneaking look and such a funny bark at night and morning. His safety

is in being able to run fast. He is fond of rabbits and chickens. The coyote is very cunning, and if you are looking for him you will seldom see him.

The rabbit is a timid little animal. His home is in the bushes. He has to look out for the larger

animals who would eat him if they could. His long ears are very useful, and he can run, too, when he tries.

There are many kinds of squirrels. Some eat nuts and make their homes in the trees. There they are safe except from the thoughtless boy with his gun. How gracefully they run up and down the trees and jump from branch to branch.

The ground squirrel does not care for trees. His food is in the grainfields, and to get a safe home he burrows in the ground. Like the gophers and prairie-dogs, a number of ground squirrels form a colony and live in a little village together.

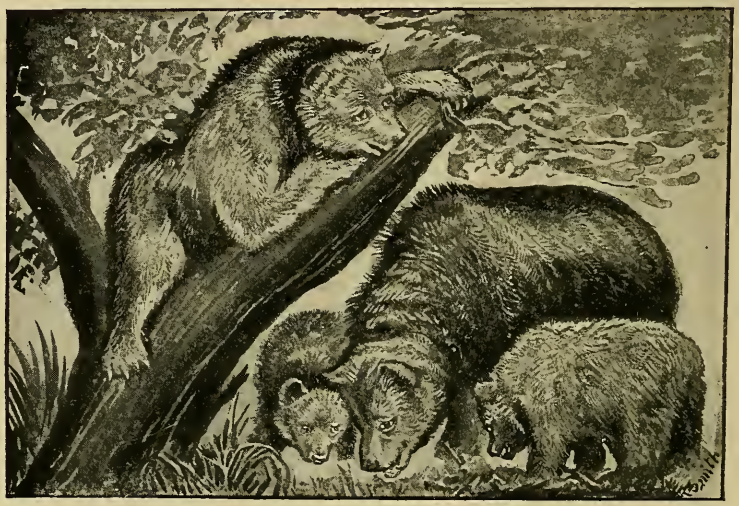
In places their holes are so thick that it is dangerous to ride over the ground on horseback. How straight they sit up in front of their holes! When alarmed they drop out of sight with a quick whistle.

Have you ever seen a wildcat? This animal is much larger than the house cat. It has a yellowish color and short tail. Perhaps you have seen little kittens spit and scratch. Before they have been handled much they act as the wild kittens do. The wildcat cannot run like the coyote, but it will fight more for its protection. It is fond of rabbits and chickens too.

There are many animals that have been hunted so much they are seldom seen. Among these is the bear. We find it now only in the wildest places where few people go.

In the fall we may see them around the berry

patches. The bears love blackberries and huckleberries as well as manzanita berries and hazel nuts. The bear sleeps through the winter. In the spring he comes out of his den very thin and hungry.



BEARS.

How beautiful and graceful the deer are! They have good noses and slender legs. By these means they protect themselves from the most of the other animals except man.

Do you not think it is wrong to kill the deer for sport? They enjoy life as well as we do. They will soon be gone if we do not stop hunting them.

QUESTIONS.

How do animals differ from plants?

Mention some plant eating animals. What animals eat meat?

What kind of teeth has the dog? What are his claws for?

Do you know any animals that eat both animal and plant food?

What kind of teeth do we have? What is our food?

Do you know any plants that live upon the juices of other plants?

Can you imagine why the mole lives in the ground?

What animals love grain? What ones eat nuts?

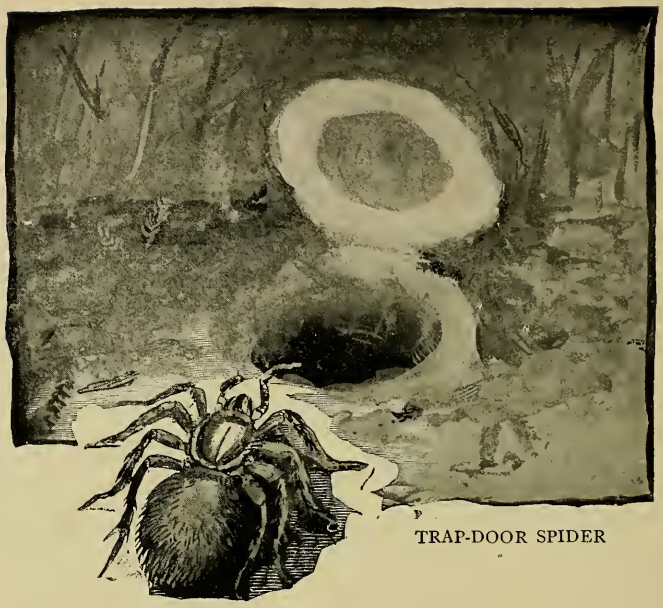
What ones have slender legs for running away from their enemies?

What kinds of food do bears like best?

Why is it that so many wild animals have disappeared?

How shall we protect the animals?

Do you not think the woods would be lonesome without any of the wild animals or birds?



TRAP-DOOR SPIDER

HOMES OF THE ANIMALS.

Every animal lives where it can get the kind of food that it likes. Some animals stay near the same place the whole of their lives. They either store up food for the winter, or go to sleep in some protected place, and never wake until spring.

Other animals never have a home. They wander here and there in search of food. When winter comes they seek a warmer climate; in spring they return toward their summer feeding grounds.

Among the animals that never have permanent homes are the wild horses. They wander in bands

wherever there is grass and water; in winter they dig the snow away with their feet, and in this way reach the grass.

The little colts do not need a shelter. They can run and play when they are only two or three days old. Their mother is strong and watchful and can protect them from the coyotes and mountain lions.

The squirrel has a snug home in a hollow tree. In this he stores a supply of nuts for the winter. The little squirrels need protection and they are safe within the tree. If the supply of nuts is short they go to sleep until spring.

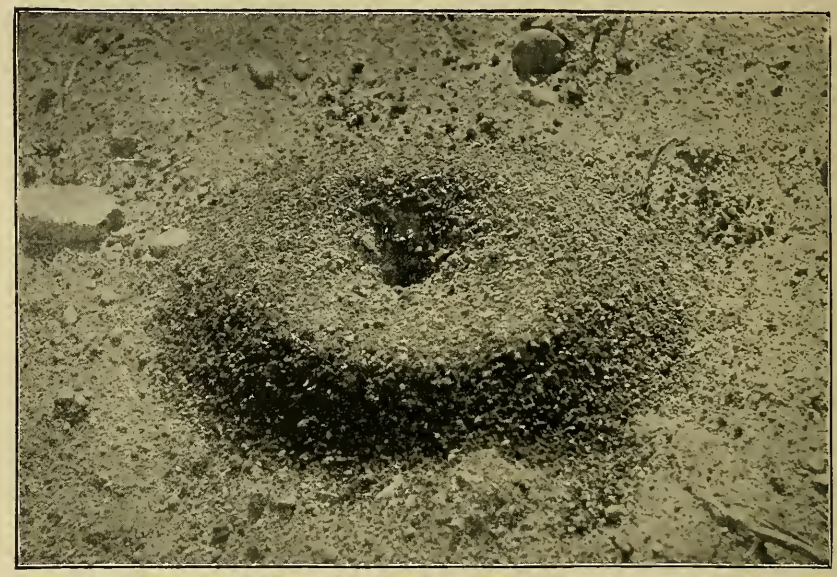
You have all seen the cozy nest of the mouse. The young mice are blind and helpless. They could not live without the protection of the soft nest so cunningly hidden away. Kittens and puppies also need a snug home for many days.

Some of the homes are so strange! The wood rat gathers a great pile of twigs under which his nest is made. The trap door spider lives in a little tube in the ground. The tube is about six inches long and has a trap door at the upper end. The door is strong and hinged, so that when the spider goes home it will shut out the rain, and protect him from his enemies.

The ants build homes underground. They

seem busy all of the time. The dirt which they take from the underground passage ways is piled neatly around the door.

You will find the hermit crab among the rocks



THE HOME OF THE ANT.

at low tide. He carries his home on his back. The home is not his own, but one he has stolen.

When he is in need of a new house he finds an empty turban shell or a periwinkle and crawls into it. If it fits, he stays there. How funny he looks as he runs around with the clumsy shell upon his back.

Each kind of bird makes a different nest. The eagle's nest is a rude, coarse home for the little ones, but the humming bird's is of softest down.

When the little birds grow up they build nests just like those they were hatched in. The mother birds teach them in some way so that they never forget.

QUESTIONS.

What is the use of a home?

Mention some animals that do not have homes.

Of what does the mouse build its nest?

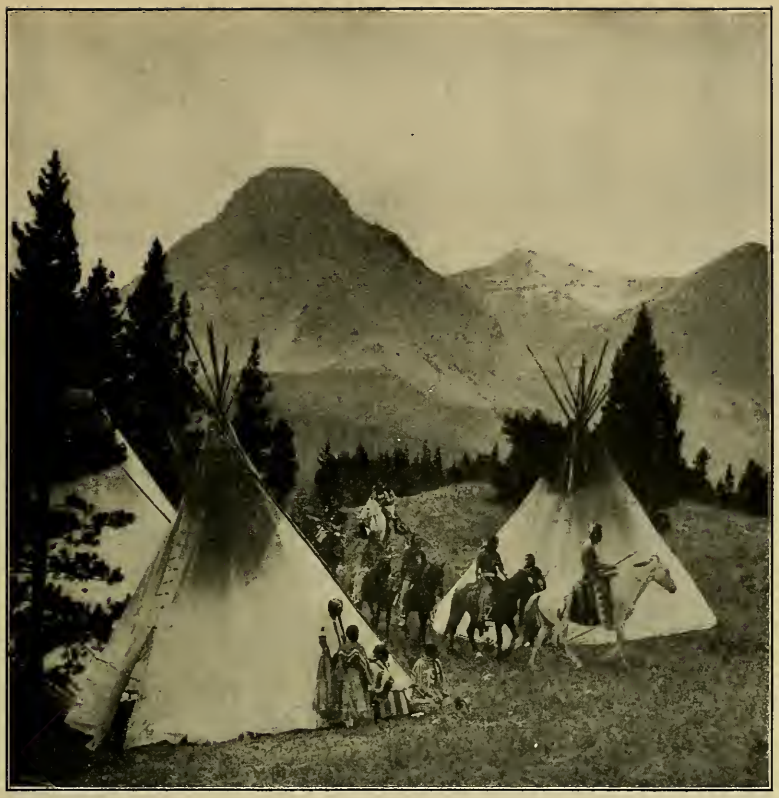
Mention some animals that make their homes in the ground.

Mention some that make their homes under stones and logs.

What is the home of a bear called? What does the bear do in the winter?

Where do birds go in the winter? Are there any that stay with us through the winter?

INDIAN HOMES.



ENCAMPMENT OF BLACKFEET INDIANS, GLACIER NATIONAL PARK

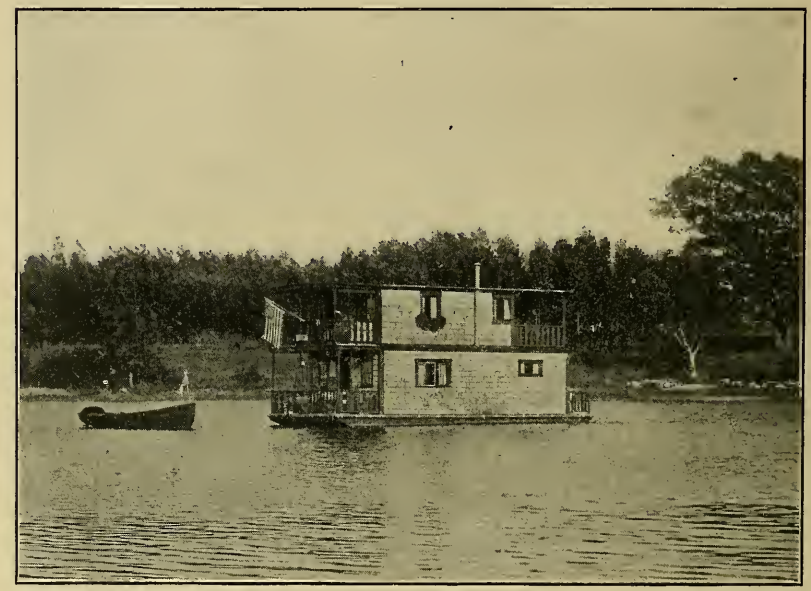
OUR HOMES.

A long time ago people did not have beautiful homes. Then all the people on the earth were rude and savage. They wandered from place to place for food, and were like animals in many ways.

What sort of homes do you suppose these savage people had? They spent hardly as much time

upon their shelters as the birds do upon their nests. Some of them lived in caves which they found in the rocks. Others built rude huts of bark or reeds to protect them from the cold and rain.

People chose places to live where they would



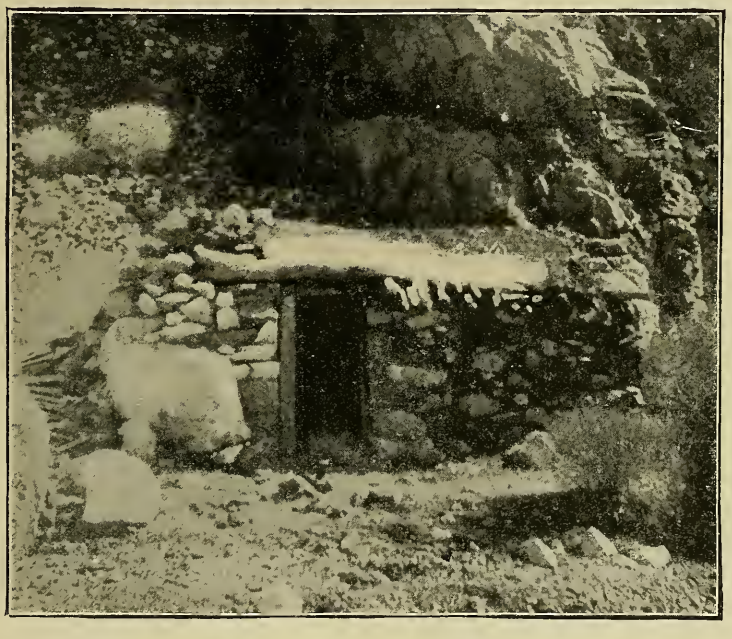
A HOUSE BOAT

be safe from the wild animals. They had also to defend themselves in their fights with each other.

Then hunting and fishing was the chief occupation of the people, and they had to go where there was game to be found. When they discovered that they could raise grain and vegetables they did not

move so much. Staying longer in one place they built better homes.

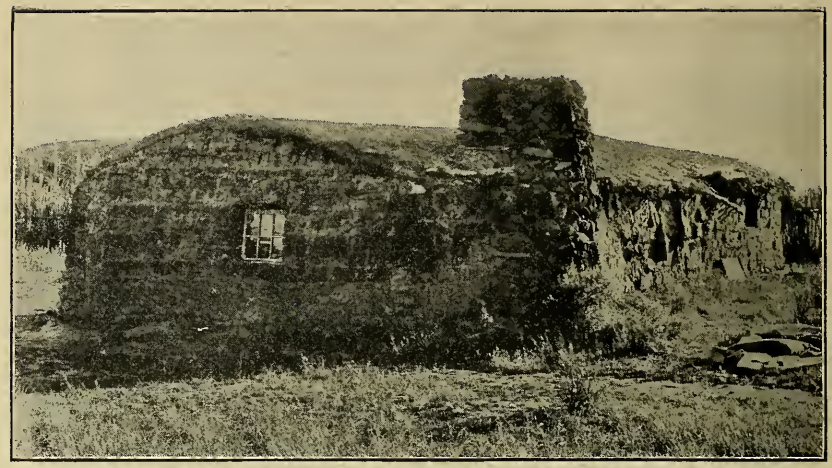
Everything is quite different now. A part of the people upon the earth have become civilized. Many of us have never seen savages or Indians.



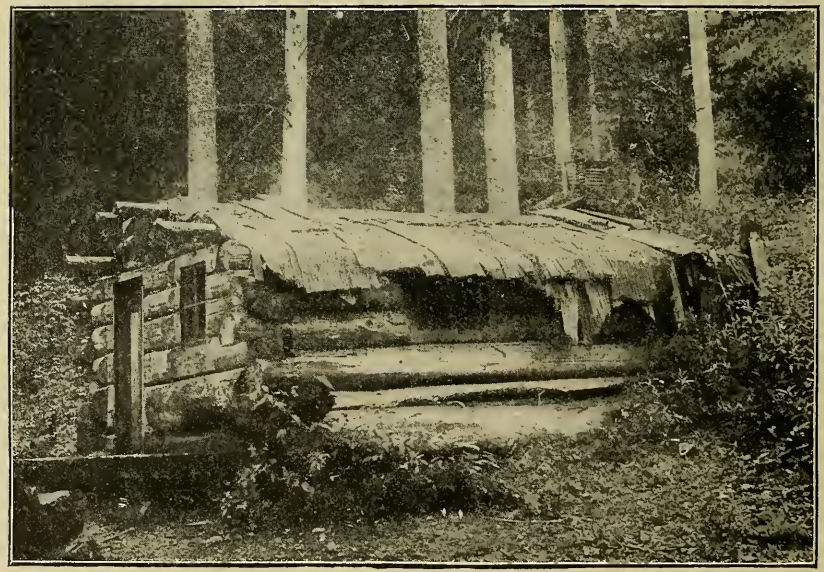
A STONE CABIN.

We live in houses which have cost much money and work. Lumber and stone and iron are used.

We do not have to move from one place to another to get enough to eat. People who live far apart exchange goods with each other. Things



A SOD CABIN



A LOG CABIN

which we need we go to the store and buy. We do not have to travel hundreds of miles to get them.

We build our homes for protection from the weather. We fill them with all sorts of things. Some of these are to be used. Others are to make our homes beautiful. We do not fear wild animals now. We do not fear the attacks of savages.

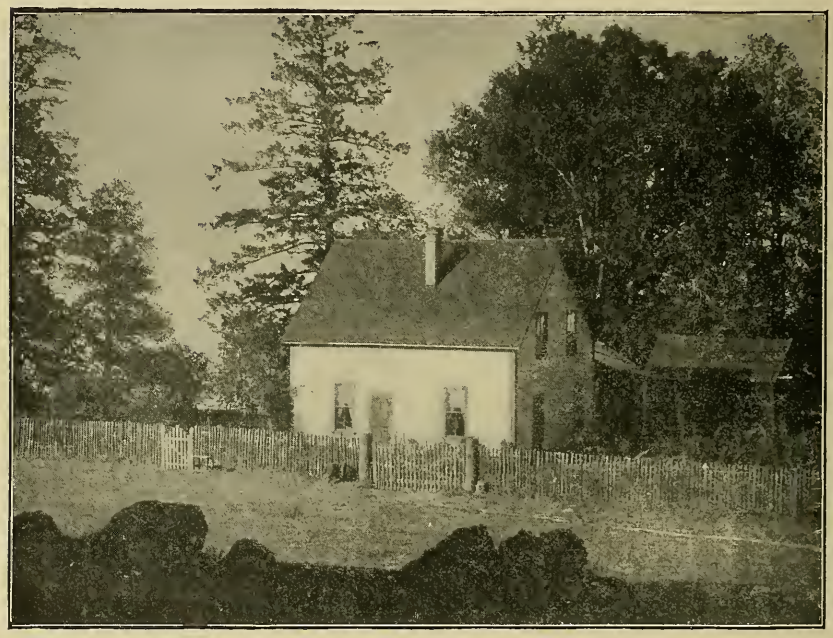
CABIN MADE OF ROCK SALT.

Let us find out something more about the materials that our homes are made of. Where there are many trees sawmills are put up to cut the logs into boards. Where there are no sawmills the houses are made of logs. The roof is often made of the bark of trees.

Where there are no trees or lumber to be had,

the houses are made of stone or adobe. There are many kinds of stone. It is quarried out of the earth.

Adobe bricks are made by mixing clay and chopped straw. This material is pressed into molds and then left in the sun to dry. The red bricks



A HOME IN THE COUNTRY.

which you have seen are made by baking a mixture of sand and clay. The roofs of adobe houses are often made of brush on which mud is spread. This does not keep out the rain very well.

Did you ever see a sod house? Square pieces

of grass sod are cut and piled up like bricks. A dugout is a house made partly in the ground.

What would you think of a house made of salt? Away in the desert of eastern California there is a neat little cabin built of blocks of rock salt.

ESKIMO IGLOO.

The Indians of North America lived in wigwams, rude structures made of the skins of animals or of the barks of the trees of the forests.

In the far North the Eskimos in the winter build their homes of snow, as the best material to keep out the cold. In fact, climate and suitable material has, even in the most civilized countries, much to do with

the style of building adopted. Flat roofs or no roofs at all are preferred in lands where no rain falls, as in parts of Egypt and India; slightly sloping roofs where rain but no snow falls, and high pitched roofs, to shed the snow, are common in all Northern lands.

A COLONIAL HOME IN NEW ENGLAND

QUESTIONS.

What kind of houses did people have a long time ago?

Where did they select places for their homes?

How did their homes differ from those of animals?

Why do we build better houses to-day?

Why do we not have to go here and there for food?

Have you ever seen the home of an Indian? Of what was it made?

Have you ever seen a log cabin? What is a dugout?

Have you ever been in a cave? How would it do for a home?

What is rock salt?

Would a house of rock salt stand long where it rains much?

RED MEN'S MODE OF TRANSPORTATION

HOW PEOPLE USED TO TRAVEL.

We have not always had steamers and cars to carry us about. How fast they take us! We almost seem to fly like the birds.

It was only a few years ago that steamers and cars were first made. Before that time it would have taken us several months to cross our country from the east to the west. Now we can go from the Atlantic ocean to the Pacific ocean in about four days.

We have learned that a long, long time ago people everywhere lived as savages do to-day. They did not have the nice things that we have. They

could not take long journeys because they had to walk wherever they went.

Finally some of these people who lived so long ago made a discovery. They discovered what all the boys know who live near a pond of water. They found that they could ride upon the water by getting upon a piece of wood.

They soon learned to make canoes out of logs. They could ride in the canoes and keep dry. At first poles were used to push the canoes along. Then they made paddles.

These people who lived so long ago we call savages. After they had discovered how to ride on the water traveling became easier. They went up and down rivers and across small lakes. They were careful, however, not to get too far from land. Their boats were small and could not stand the great waves of the ocean.

Have you ever seen the graceful canoes which the Indian makes to-day? Along the coast of Alaska the Indians hew their canoes out of great cedar logs. Some of the canoes are large enough to hold fifty people.

Some of the Indians of the North make their canoes out of the skins of animals. Birch bark canoes are light and pretty. An Indian can carry one upon his back for a long distance.

Did you ever try paddling a canoe? Do you not think it is hard work? We are sure that the Indian was very happy who first found that he could make the wind send his canoe through the water.

By putting up a little piece of cloth or matting the wind would make the canoe go faster than he

HAULING FREIGHT BEFORE THE RAILROADS WERE BUILT.

could paddle it. All that he had to do was to sit in the back end and steer it with a paddle.

While they were still savages our grandfathers became tired of carrying things on their backs when they made journeys over the land. Then they thought they might make use of some of the wild

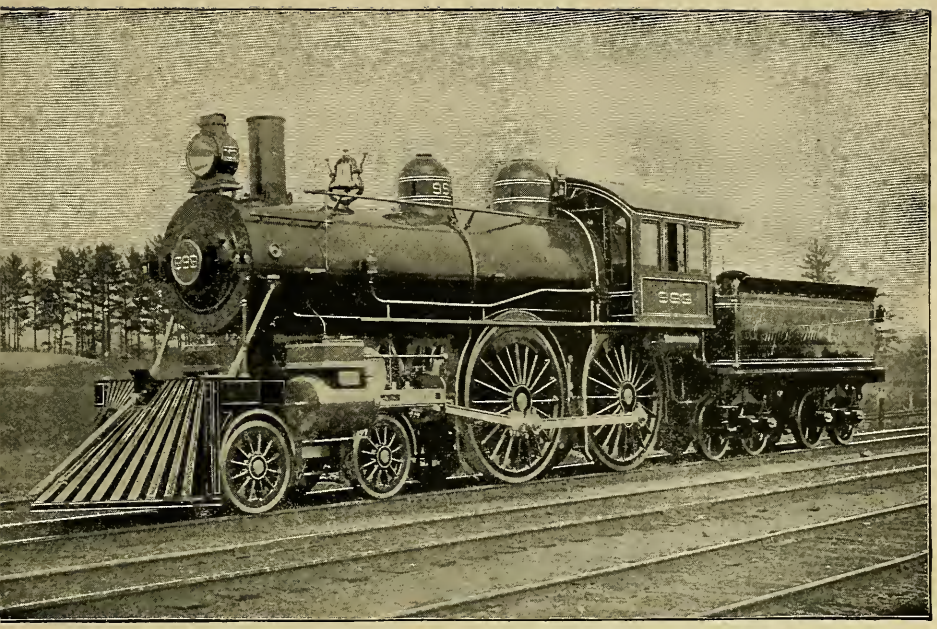
animals. They caught the wild horse, and the camel, and the elephant, and tamed them. These animals are very intelligent, and they soon learned to carry heavy loads.

Where there were great plains to be crossed the camel was used. This animal can go a long time without water. Where there were few streams people traveled mostly by land. Where there were many rivers and lakes they went by water.

The people who lived long ago had no way of crossing the high mountains. They could not cross the oceans with their frail boats. They could not learn about the world as we can now. Would you like to have lived then?

QUESTIONS.

What animals are used the most for riding?
What is the fastest animal that we use?
Are there any wild horses in our country?
What is the largest animal that has been tamed?
Where are elephants found? Describe their appearance.
What animals are used in the North for hauling sleds?
What are oxen used for?
Describe some of the ways in which canoes are made.
How did people cross rivers before they had boats?
Mention the different animals used for carrying loads.



TRAVELING TO–DAY

We can travel now as far in one day as people once could in a month. We can sit in an easy chair in a car and be as comfortable as at home. The train carries us across the rivers and through the mountains. It does not stop for anything.

One hundred years ago there were no railroads and only a few wagon roads. People did not then travel as much as they do now. Trails were made first. Over these they could walk or ride horseback. Then wagon roads were made. They were at first very rough and muddy when it rained.

You all know how roads are graded now. If there is a hill in the path of a road, powder is used and the rock is blasted away. The road is made upon a gentle slope, so that the horses can pull a heavy load.

A ROAD CUT THROUGH A HILL.

Roads are made smooth and hard by putting on them a layer of crushed rock and drawing heavy rollers over the rock. Where many people travel roads are sprinkled so that they will not become dusty.

Many railroads have been built through the valleys where the most of the people live. They have also been built across broad deserts, so that

those who live upon opposite sides of the desert can go back and forth.

Mountain ranges used to separate people. Those living upon one side did not know anything about the other side. Long tunnels have been dug through mountains, so that now we can cross a mountain as easily as we used to cross a plain.

Great steamers move over the oceans. They are much swifter and more comfortable than sailing vessels. Steamers do not have to wait for favorable winds.

Let us take a trip from the city to a mine in the high mountains. We shall see how people travel in all kinds of places.

We will first go on board a steamer and ride up the river for a few miles. Our steamer does not mind the wind, and it can move against the current of the river. The steamer is like a floating hotel. There is everything on it that we need.

As soon as we get where the river becomes shallow the steamer has to stop. Now we leave it and take the cars. For many hours the engine pulls our train through a nearly level country. There are many people living here, and much produce to be carried back and forth.

At last the mountains come in sight. Now the train moves more slowly. The land slopes upward

toward the mountains and the engine has to work hard. How it puffs as the train winds among the hills like a great snake!

By and by we reach the end of a valley and here the railroad ends. The steep mountains rise all around us.

We leave the cars wondering what we shall ride in next. We are not long in finding out. Near by stands a huge stage-coach with six horses hitched to it. We climb in and the driver cracks his whip. Away we go up the mountain road. Up we go mile after mile. We ride along the sides of rocky cañons

so deep that we can hardly see their bottoms. The road is rough and we hold tightly to the stage coach to keep from being thrown off.

TOURISTS ON TRAIL AT ALTYN LAKE, ON PIEGAN PASS TRAIL, GOULD MOUNTAIN.

At last we come to the end of the road. Now we shall surely have to walk, for the mine where we wish to go is higher still. No, there is a string of mules waiting for us. Some of them have packs on their backs. Others are saddled for us to ride.

Now we are off again through the mountain air.

We go very slowly now. The mules are careful and pick their way over the rocks and past the dangerous cliffs. It would be hard work to build a railroad here.

The mine is reached and near it is a little town. Here the miners live and work. If we wish to go farther and reach the very top of the mountains we shall have to walk.

What an interesting time we have had. In one journey we have traveled in many different ways.

QUESTIONS.

How do men go to work to make a wagon road?
In what way do people travel where there are few roads?
What is the quickest way of traveling?
Mention the different means for making street cars go.
What are paddle wheels?
How are goods carried across land where there are no railroads?
Mention other ways of traveling than those given in the lesson.
Where do we find the most railroads?
Are there any oceans or mountains that cannot be crossed?
Where are stage coaches used?

INDIAN MAKING BASKETS, CALIFORNIA.

OCCUPATIONS.

We call those people savages who lead a rude, wild life. The Indian is a savage. His life is simple. He does not trade much and has few occupations. Those things which he cannot get or make himself, he goes without.

The Indian hunts his own food. He makes his clothing from the skins of animals which he has killed. He knows how to build a rough shelter to protect his family from the storm.

Savages live very much as animals do. When food is plenty they eat all they can. When food is scarce they go hungry. They do not work any more than is necessary.

Savages do not store up food as we do. They have very few different occupations. They trade but little with each other.

When people become civilized they find that

they need many more things than they did before. There are so many different things to be done that one man cannot learn to do them all well. The father cannot find time to raise food for his family, build their home, and make their clothes. Because of this the work that has to be done in a country is divided up among different men. Each man picks out the thing that he likes to do the best and spends all his time doing that thing.

One man likes to use tools and work with wood. He becomes a carpenter and spends his time building houses for people who are doing other things.

Another man likes to work in the ground. He spends all his time raising vegetables. He learns what plants will grow best where he lives and just how to take care of them. You can easily understand that if he had to spend much of his time making clothes he would not be as good a gardener. Another man who has a taste for trading takes the vegetables and carries them from house to house, selling what is needed in each place. He learns what people want and how to get it for them.

Some men are fond of animals. They live upon a farm or ranch and raise horses, cattle and sheep. These men do not have time to raise grain and have it made into flour. They get flour from a man who makes that his business.

The tailor knows how to make clothes. He depends upon other men for all the different things which he needs to eat, as well as those which will make his home beautiful.

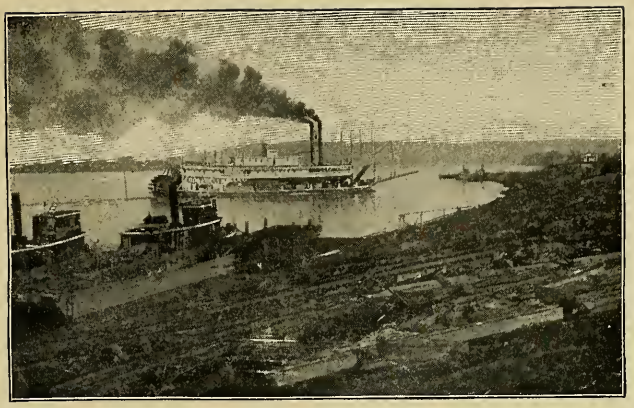
There are many trades and occupations. It would take a long time to name them all. Each man learns to do one thing. He can make his living if he does that thing well. You see now how it is that work is divided. Each of us depends upon others for the most of the things which we want.

You will be successful if you learn to do one kind of work. You will be more successful if you do that work better than any one else can. Have you heard the old saying, "Jack of all trades and master of none"? What does that mean?

QUESTIONS.

What do we mean by a savage? Who are the Indians?
Do you know what kind of homes they have?
How are we different from savages?
What kinds of work do you think the Indian does?
Mention some of the important trades or occupations?
What kind of work do you like best?
What are the occupations of people near where you live?
Why is it better to know one thing well?
What kinds of work are carried on in cities?
What work do most people in the country carry on?
What kind of work is done in the mountains?
What work do sailors do?

WARREN.



A SCENE ON THE MISSISSIPPI.

TRADE AND COMMERCE.

We have learned that the savage depends upon himself for what he needs. He is easily satisfied.

Would you be happy to change places with an Indian boy and live as he does? You would have only those things to eat which your father could get with his own hands. You would have very few playthings. Can you tell us what kinds of food would be left in your home if some one should take away everything that was not raised near by?

If all the pretty and useful things which were brought from another place or country should be taken away from your home, would it not be bare and lonely.

It is trade and commerce which makes it possible for us to have so many things. If you should

travel over the world you would find a different kind of people in every country that you came to. You would find also that each country had a different climate. Because of these things you would see many fruits that you do not have at home. You would see people dressing in strange ways and making strange things.

A long time ago all people were wild and savage like the Indians. They did not travel farther than was necessary to get something to eat. Those living on one side of the ocean did not know that on the other side there were people who had many things that were very pretty and useful.

As people slowly became civilized they traveled farther. They crossed the high mountains, and the broad oceans. Then those living in different parts of the world began to learn about each other, and how much it would be to their advantage to trade and make exchange.

In warm countries they raised more rice and oranges than were needed at home. Some of these things were exchanged for apples and grain from the cooler countries.

In one country they raised silkworms and made beautiful clothes. In another country were many sheep, and there woolen clothes were used. In still another region they raised cotton.

As people became aquainted with their neighbors they began to exchange those things of which they had an abundance for others which they did not have. In this manner trade and commerce began.

Now a great many people spend all their time carrying goods from one part of the earth to another. They bring us many things which we enjoy greatly. They carry to other people beyond the ocean the fruit which we raise and the things which we make.

Railroad trains and steamers go all over the world. The people in the farthest islands are

becoming acquainted with us. They want our clothes and machines. We want the pretty things which they make or the fruit which they raise.

QUESTIONS.

What is trade or commerce?

What is made near your home and shipped away?

What does the farmer raise near your home?

What do you eat that is brought from across the ocean?

What things in your home came from another country?

What fruits are brought from the South?

What do we ship to the people in Alaska? What do they raise in Alaska?

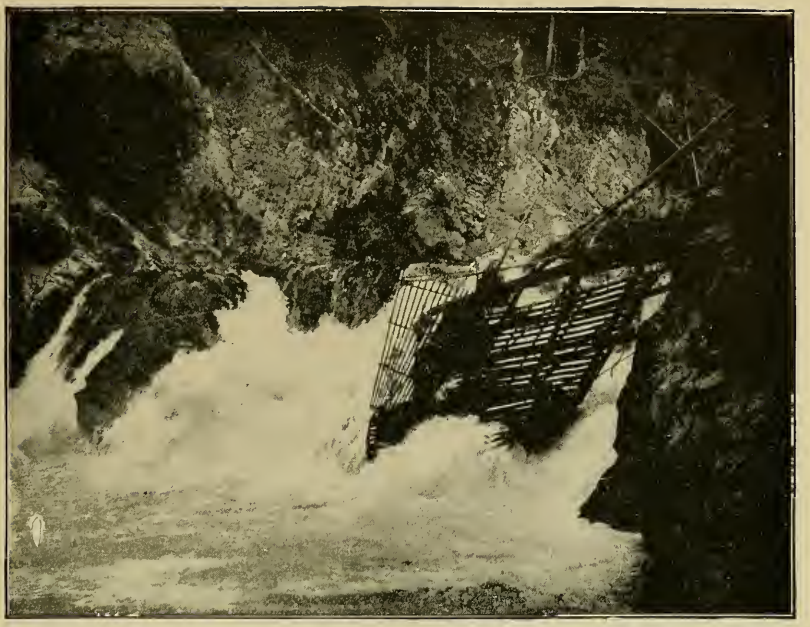
What is the chief occupation in Alaska?

What do we drink that comes from the East?

Could you live upon what is raised near your home? Mention the important things.

What are people called who buy and sell?

How are goods carried from one country to another?



AN INDIAN FISH TRAP.

HUNTING AND FISHING

A long time ago people lived mostly by hunting and fishing. Every man had his bow and arrows and when he became hungry killed what animals he needed for food. He caught fish by means of traps made of sticks woven together. These he placed in a stream where there was a rapid or waterfall.

When people became civilized they did not depend so much upon hunting and fishing for their food. They tamed some of the wild animals and raised large herds and flocks. They also discovered

that many wild plants could be made to furnish food when they were cultivated.

We have much better weapons for killing wild animals than our grandfathers had a long time ago. Our guns have destroyed the animals so rapidly that in many places very few are left.

We have also invented great nets and sharp hooks to catch fish, so that in many streams the fish are nearly gone. The ocean, however, is so large that we can never catch all the fish out of it.

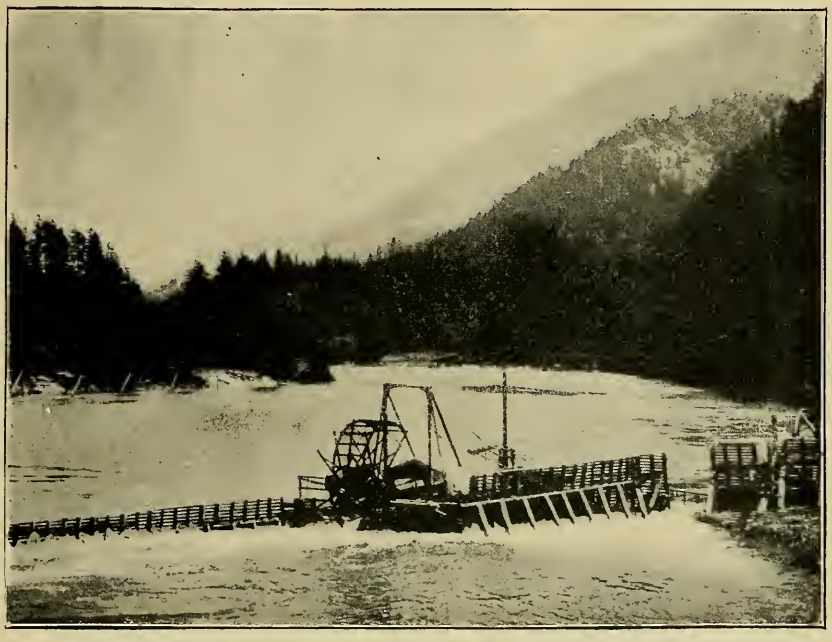
Is it not wrong to kill the animals and birds for sport? Our grandfathers killed them only when they were hungry. Our world would be rather lonely without the pretty birds and graceful animals. We must protect them instead of wastefully destroying them.

The most of the meat which is now used for food is supplied by animals that have been tamed. Food is only one of the many useful things which the herds of cattle and sheep afford us.

Streams where much fishing is done are now supplied with young fish from places called hatcheries. In such places fish are collected and their spawn or eggs saved. When the eggs are hatched the little fish are sent to those streams where they are needed.

The most of the men whose occupation is fish-

ing live by the large lakes or along the ocean. They spend their whole lives catching fish for the market. A part of the fish which they catch is sold fresh. Some kinds of fish are canned. Others are salted and dried.



A FISH-WHEEL ON THE COLUMBIA RIVER.

The life of the fisherman is a hard one. He has to be out in the rain and storm. He often spends days without catching anything.

The whale and seal are hunted in the far north where the most of these animals make their home.

The life of the whaler is more dangerous than that of the fisherman. He has to stay in the Arctic ocean and among the icebergs for many months. Many whaling ships have been caught and crushed in the ice.

We can no longer depend upon wild animals for our food, as people did long ago. There are more people in the world now and many of the animals which were abundant once have all been killed.

Some are found now in only a few places. These will soon be gone if we do not take better care of them.

Birds, animals and fish furnish us many things that we need. We cannot do without them. They also help make our world a pleasant place in which to live.

QUESTIONS.

Can you mention some of the animals that our grandfathers used to hunt?

Mention the most important animals that have been tamed.

What ones supply us with meat?

What wild birds have been tamed?

What do these birds now supply us with?

Mention some of the things obtained from the whale.

What fish are canned? What ones salted and dried?

What animals are hunted near your home?

FARMING.

Who is it that raises our corn and wheat? Who is it that comes to town with fat chickens and bright red apples? We call him the farmer, and his work farming.

We think there is no nicer place than a pretty farm to spend a part of the summer. There we can get fresh butter and milk and pure water. We have such happy times romping in the fields and woods. There are no narrow streets and tall buildings to shut out the sun. The work of the farmer is hard, but he has the bright, happy world about him.

The farmer boy often thinks the farm is not a pleasant place. He wants to go to the city. He forgets how much he would lose if he left the farm. He has around him the birds and animals, and green

trees. He can go swimming and fishing. In the city he would be like a bird in a cage.

There are many different kinds of farming. In one place the soil and climate make fine apples. There the country is dotted with orchards.

PLOWING.

In another place where the land is moist there are great meadows. There upon the meadows are thousands of cattle feeding. This is where butter and cheese are made.

In the hot valleys where the summers are long and dry there are miles and miles of vineyards. Here they make raisins by drying the grapes in the sun. From the juice of the grapes wine is made.

Upon the plains and prairies we find wheat fields stretching as far as the eye can reach. How pretty the grain looks, when nearly ripe, waving in

STACKING HAY.

the afternoon breeze. From these fields the grain, after being ground into flour, is shipped to all parts of the world.

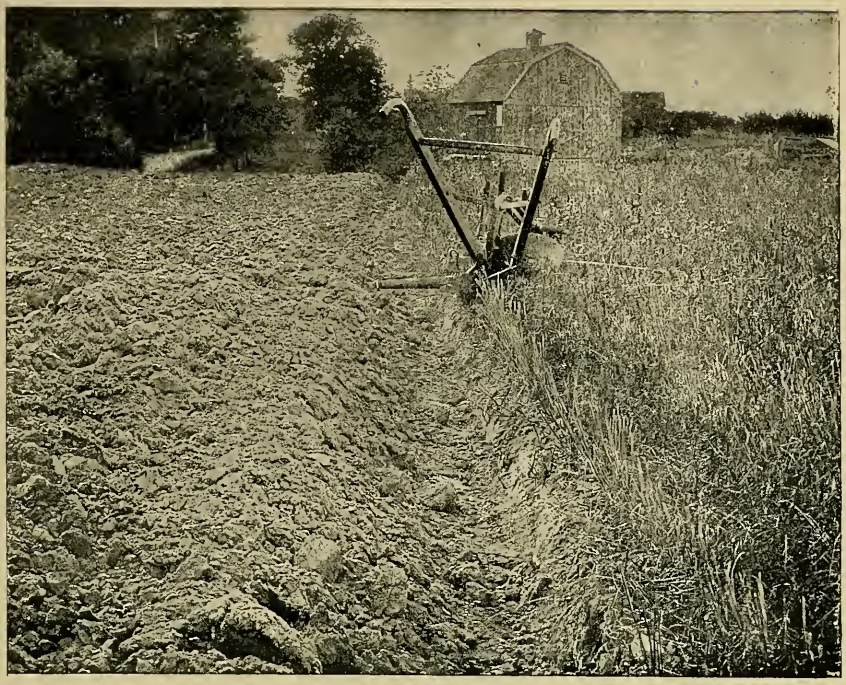
Near the cities there are extensive gardens where many people are employed. Each morning some one comes to our doors bringing berries and vegetables fresh from these gardens.

The best farms are where the soil is deep and there is plenty of water. In most places it rains enough so that the farmer can raise all he wishes. In other places ditches many miles long are dug.

Through these, water is led from some river, and then allowed to flow over the land. This is called irrigation.

AN IRRIGATING DITCH.

In selecting a farm we think that the kind of soil is important. Water is even more important. Without water the richest soil would be only a desert.



IDEAL PLOWING

QUESTIONS.

What are the advantages of living on a farm?

Where would you look for a farm, in the valley or on the mountain? Why?

Mention some of the grains which a farmer raises.

What is necessary to make a good farm?

What do the farmers raise near your home?

Of what use are meadows?

What kinds of work does the farmer boy have to do?

How do farmers raise fruits and vegetables where it does not rain?

Would you rather live on a farm or in the city? Why?

COWBOY.

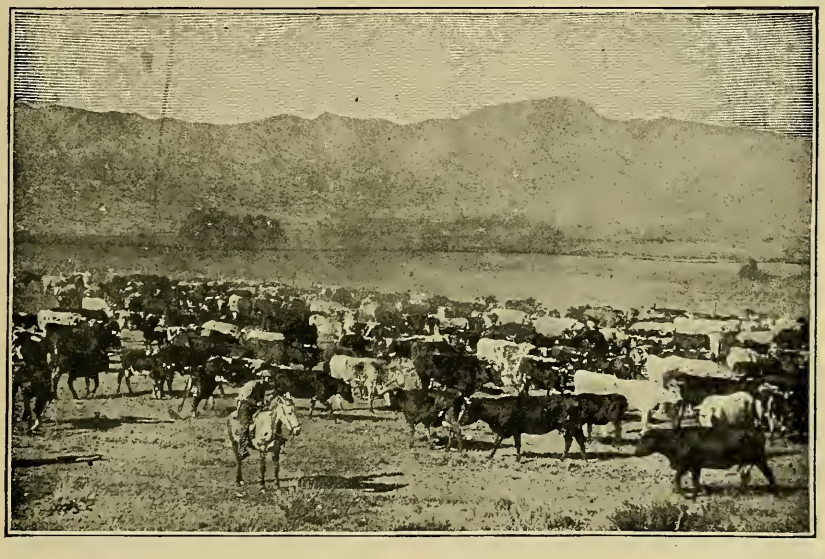
STOCK RAISING.

In the eastern part of our country the farms are small. Each farmer raises a few horses, cattle, and perhaps sheep.

In the west the farms or ranches are often very large. They reach for miles and miles across the plains and over the mountains. Upon these large ranches they often raise nothing but stock.

The farmer in the east keeps his cattle in a little field called a pasture. He may drive them to the barnyard every night.

The land over which the cattle wander upon the great stock ranches is called the range. The men who look after the cattle are called cow-boys or vaqueros. Few people live upon these large ranches and the cattle become almost as wild as deer.



A ROUND UP.

Once a year the cattle are rounded up. The cow-boys ride over the ranch on horseback and gather all the cattle in a great bunch. It often takes them many days to do this.

The steers that are full grown are separated in order to be driven away to market. The little calves are marked with a hot iron so that it may be known

to whom they belong. This is called branding. What a bellowing the calves and their mothers make. The cattle are afraid of men on horseback, but it is not safe to go among them on foot.

In some parts of the west there are bands of

A FLOCK OF SHEEP.

wild horses. They have escaped from ranches and after many years become very wild.

How full of life they appear as they dash across the plains. These horses are often called mustangs. They are so wild that it is difficult to break them to ride.

Sheep and goats are not allowed to wander

alone as the cattle do. They would be destroyed by the coyotes and mountain lions.

The sheep are divided up so that there are one thousand to three thousand in each band. A man called a herder has charge of each band. With his shepherd dogs, who are very intelligent and trained to do whatever is needed, the herder keeps the sheep together. At night they are driven into a coral where they will be safe from the wild animals.

Wherever you find a band of sheep in the mountains of the west you are sure to see a herder watching them. There he goes as the sheep feed along. He has a canteen upon his shoulder for carrying water, and a donkey by his side. The donkey carries his food and blankets.

In this way the man follows the sheep from place to place through the summer. The life of a sheep herder is a very lonely one.

Once or twice a year the sheep are washed and sheared. The wool is packed in bales and shipped to market.

QUESTIONS.

How do the vaqueros catch the wild horses and cattle?

Why are the cattle so wild upon the large ranches?

Would our milk cows become wild if they were turned loose in the mountains?

What uses are made of the different parts of the sheep?

Why are not the sheep allowed to run loose?

Of what use are goats?

Have you ever seen a band of sheep? How do the herders drive them?

Why do they brand the calves?

In what different ways is meat preserved?

What names are given to the flesh of the pig?

Do you know what the food of the pig is?

BIG LOGS IN ANACORTES—WASHINGTON MILL BOOM

LUMBERING.

Do you know where the lumber came from which was used in making your house? The boards and beams have an interesting story to tell.

They were once a part of some tall pine trees in a dense forest. The forest covered many miles of the steep mountain sides.

For many years the forest stood there. Each year the trees grew a little larger and taller. Perhaps you have seen the rings in a saw log. These show the number of years that the tree has been growing. One ring represents a year.

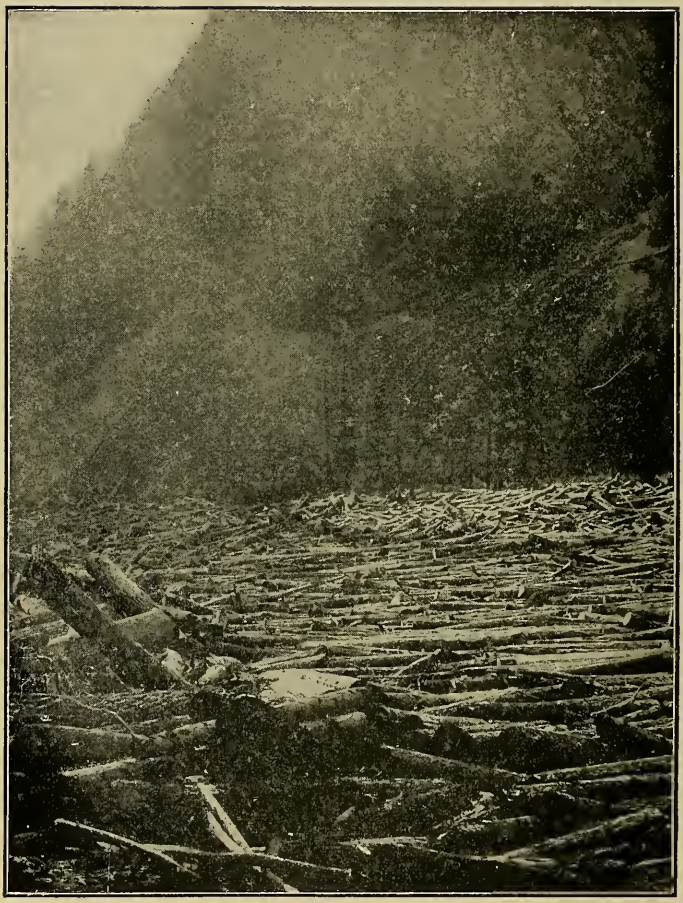
FELLING LONG-LEAF YELLOW PINE TREES, LOUISIANA

The older trees of the forest partly decayed, and the winter storms threw them to the ground. Each year some of the nuts in the pine cones escaped the eyes of the watchful squirrels. Some of these nuts became covered in the earth and

CUTTING UP LONG-LEAF PINE, LOUISIANA

sprouted, soon forming baby pines. The little pines slowly grew up and took the places of the older trees.

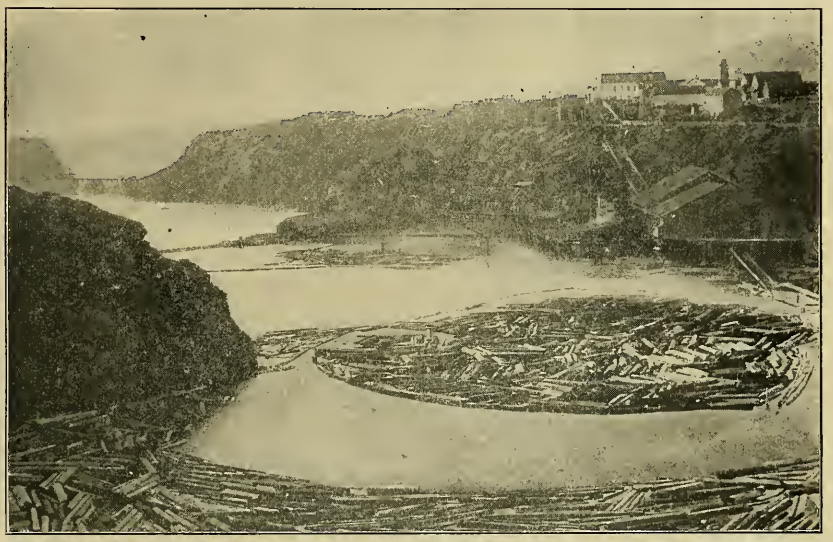
At last some men found the forest. The trees suited them and they sent other men with saws and axes to cut the trees down. After being cut down



LOG JAM IN THE MOUNTAINS, BY BLACKFOOT RIVER, MONTANA

they were sawed into logs. When the snow came oxen were hitched to great sleds, and the logs were hauled to the bank of the nearest river.

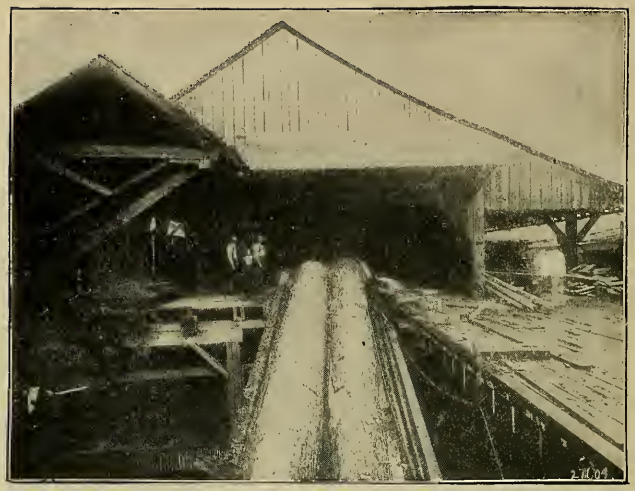
In the spring, when the snow melted and the river rose, the logs were rolled into the water. Away



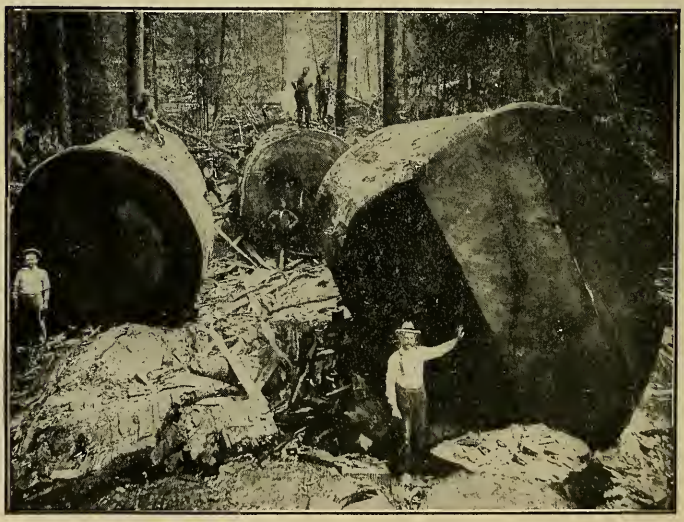
SAW MILL AND BOOM OF LOGS.

they went in great numbers, almost hiding the river. The logs floated down the river for miles and at last stopped at a big dam before a sawmill.

Then one by one the logs were pulled out of the water and run into the mill. How interesting the machinery is! It picks up each log as easily as you would a little stick. Very soon the buzzing



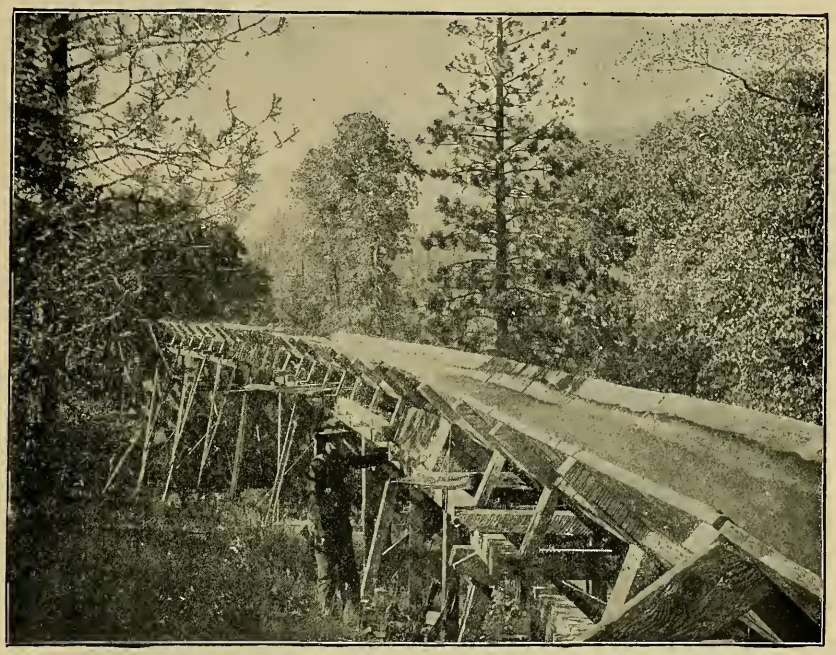
HAULING LOG UP INCLINE INTO MILL OF CURTIS LUMBER COMPANY, MILL CITY, OREGON



CUTTING REDWOOD TREES IN CALIFORNIA

saws have changed the rough logs to smooth, clean boards.

Railroads are now built into the forests and the logs are hauled out on the cars. The sawmills are



A LUMBER FLUME

placed where the lumber can be shipped to market easily. They are sometimes upon a bay by the ocean. Sometimes they are upon a river if the river is large enough for boats to come up to the mill.

How do you suppose the lumber is shipped to market from the sawmills high up in the mountains?

REDWOOD LOGS FROM FOREST TO MILL

LUMBER CAMP IN OPEN WOODS, FLAGSTAFF, ARIZONA

The lumbermen build what is called a flume. This is a V-shaped trough made of planks. The flume is extended around the mountain sides and along the cañons for many miles. It is made to slope enough so that the water will run through it swiftly. When everything is ready water is turned into the flume. The lumber is thrown into the water, and away it is carried, mile after mile, until it reaches the end of the flume. There it is placed upon boats or cars.

We ought to be careful of our beautiful forests. They have been many years in growing. They shelter the birds and the animals. They protect the soil from drying out.

It takes so many, many years for a little pine to become a great tree, that if we are not careful of the forests they will soon be gone. We should guard our forests well, and set out young trees as fast as we cut the old ones down.

QUESTIONS.

How does wood look when it is decaying?
Describe the way in which the cones hold the little nuts.
Why should we be careful of the forests?
How many years do you suppose it takes a large tree to grow?
Mention all the different kinds of trees used for lumber.
What is the kind most commonly used?
Where did the lumber in your house come from?
Describe what you have seen in the woods.

THE COUNTRY STORE.

Perhaps you live in the country. If you do, you can tell us something about the store near by.

The store may be the center of the little world in which you live. There your father goes to buy the sugar, flour and many other things which you need. There, in most country villages, the post-office is located.

Can you tell why the store was put where it is? Look around carefully and perhaps you can discover the reason. If you learn to understand the little world about your home it will help to make interesting the study of the large world which lies beyond.

We see first that the store is often upon a corner where two roads cross each other. It was placed here so that it could be reached easily by the people living near by.

You would not look for a store where there were no people. People live mostly in valleys where the climate is pleasant and the soil is rich.

If many people come to live in the country near the store there will be much buying and selling. All of the business cannot be carried on in one store and a little town may grow up.

There will be a post-office in one building, a dry-goods store in another, and a hotel in still another. There will have to be a blacksmith shop, and a school house and perhaps a church. Many people will come to sell what they have raised, and get other things in exchange.

Thus we see that a little store well situated for trade may be the beginning of a town.

There are other places in which a town may be built. A mill is placed near a waterfall in the river. People come to the mill to have their grain made into flour. A post-office is started there and finally a school. If the water power is good the town may at last grow to be a city.

A town may also grow up where there is a mine. Such a town does not depend upon fertile land or mills to bring people. The mine may be a coal mine. Coal is needed for many purposes and people will go almost anywhere to get it.

You may also find a store upon a bay by the ocean. The bay offers protection to the fishermen. They bring their fish to the store to be shipped away and get their supplies in return.

If the water of the bay is deep large ships will come in to unload and the business carried on will make a town.

You will always find that there is a reason for

the store or town being placed where it is. This is either because of fertile lands near by or because of water power, or mining, or easy communication with the country around, or of trade with other parts of the world.

QUESTIONS.

Is your home near a store? Why was the store placed where it is?

What business is carried on in the store?

Mention some of the things which the farmers bring to the store to sell.

What do the farmers buy at the store?

Why is a mill often placed by a waterfall?

Why do you sometimes find a store upon a river or bay?

Would you expect to find a store far from where people live?

Where do you find the greater number of people, in the valleys or upon the mountains?

Mention some of the different occupations in a town.

A CITY.

SOMETHING ABOUT A CITY.

A city is a collection of many people and houses. Why do so many people live in one place? What can all of them find to do?

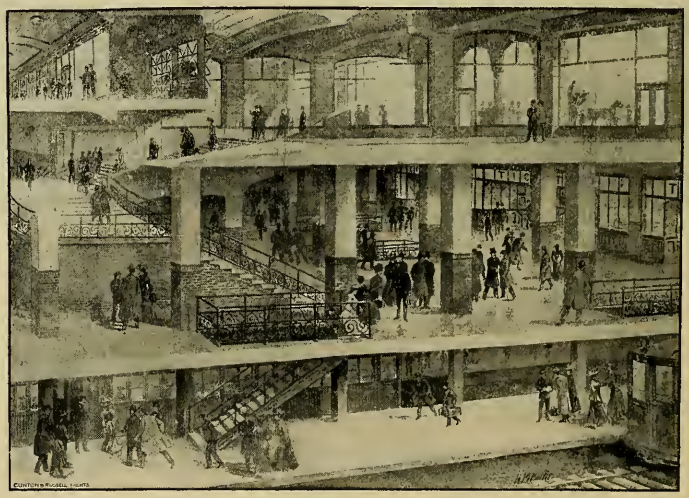
We have already learned that towns grow up where there is opportunity to trade. The town may be found in the valley, by the river, or upon the ocean shore.

The town will grow and at last become a city if it is situated where manufacturing can be carried on, and goods received and shipped far over the earth.

We will suppose that there was a little town in a rich valley near the mouth of a large river. Vessels

from across the ocean came into the harbor and unloaded their cargoes. Steamers were made to carry freight up and down the river, and railroads were built through the valleys.

The farmers sent their grain, fruit, and cattle to the town, because they could do so easily. From



SECTIONAL VIEW OF THE UNDERGROUND HUDSON TERMINAL STATION.

the town the steamers could carry these things to all parts of the earth.

The town was such a good place for trade and commerce that more and more people came there and found work. Finally manufactories of many kinds were started. Clothing and shoes could be made there cheaply. Mills were erected to grind

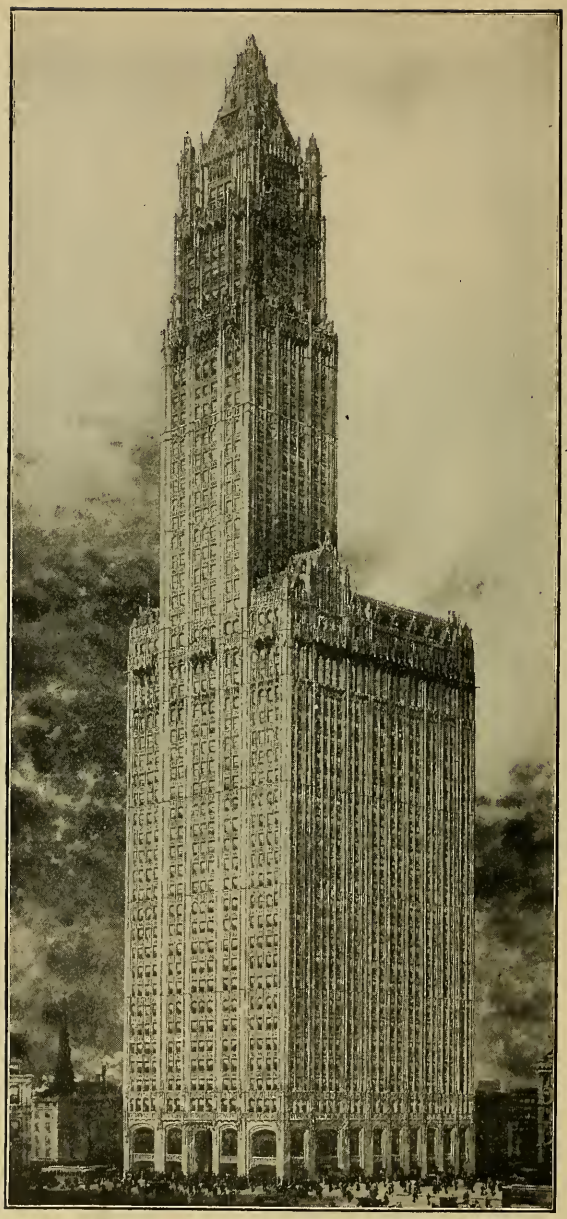
the grain. Great shops were needed for making machinery. Ships were built to help in carrying goods back and forth.

We see now that there are many kinds of work going on. As people continue to come, the work

HUDSON TERMINAL BUILDING, NEW YORK CITY.

increases. Our little town has at last become a great city.

What a noise and commotion there is! Railroad trains are going and coming. Boats are sailing in and out of the bay. We can see smoke rising from hundreds of great chimneys. Men are at work



WOOLWORTH BUILDING, NEW YORK
(Copyright, 1911, by F. W. Woolworth)

making things for the use of people all over the world.

The land where the city stands has become very valuable. Many of the buildings have been made so high that we are almost afraid that they may tumble over some time.

The streets are crowded with cars and teams, and mingled in all this confusion there are thousands of people. Some are going one way, some another. They all have work of some kind to do.

People will not come and make a great city where there are no rich lands, or bays for ships to anchor safely in. Cities grow up where there are the best opportunities to carry on trade and manufacture goods.

The position of the city is determined by the character of the land, the river, and the sea coast.

QUESTIONS.

Tell us some things about any city that you have seen.

Why was the city built where it is?

How are goods sent away from the city, by land, or river, or ocean?

What kinds of work have you seen going on in the city?

Do you think the city is a good place in which to live? If so, why?

How do people travel in a city?

Why are the buildings made so tall?

Of what different materials are the buildings made?

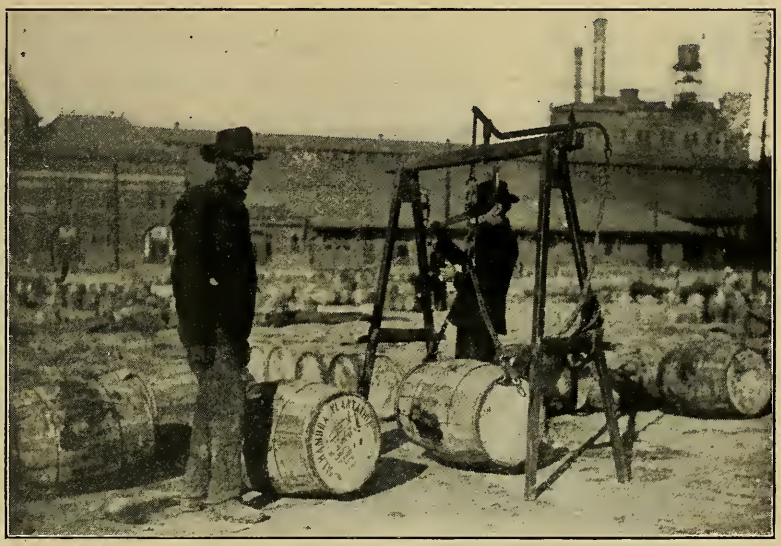
CUTTING SUGAR CANE.

THE MAKING OF SUGAR.

Where does our sugar come from? Does Nature prepare it for us, or do we have to work hard and long to get it?

The little boy from the south knows something about sugar. He says that it is made from the sugar cane. Another boy, who lives in a northern

valley, says that it is made from sugar beets. He has seen the beets growing over hundreds of acres. A third boy, whose home is among the wooded hills of the northern states, has never seen the sugar cane. He has helped the men make sugar from the sap of



WEIGHING SUGAR ON THE LEVEE AT NEW ORLEANS

the maple tree. He thinks that maple sugar is better than any of the other kinds of sugar.

Each little boy knew something about sugar, but not all.

Much of the sugar which we use is made from the juice of the sugar cane. The growing sugar cane looks something like stalks of Indian

corn. If you could bite a young stalk of sugar cane you would then understand how sweet its juice is.

The juice is obtained from the cane by pressing it between heavy rollers. The sweet liquid is then purified and evaporated. By this we mean that the water is driven off until there is left only a dark, thick syrup. The sugar crystallizes from the syrup just as salt does from water. Put a little salt in a dish of water. When the water has nearly dried up crystals of salt will commence to form around the edge of the basin.

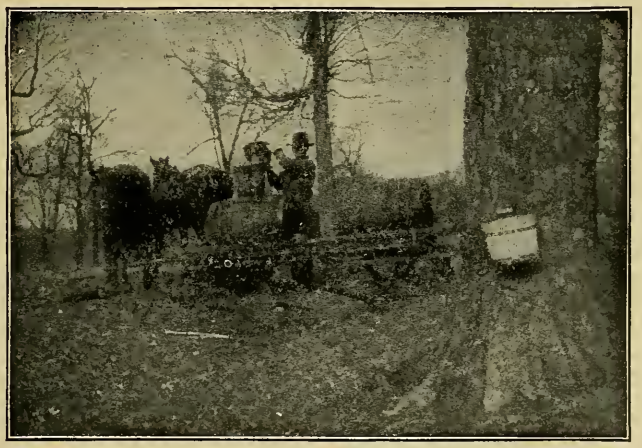
After the sugar has crystallized, the syrup that is left is given another name. It is called molasses. The sugar is not white at first. It has to go through many processes before it comes out white and granular and ready for use upon our tables.

We have all seen beets growing in the garden and have often eaten them. You would hardly think that they contained much sugar. Beets grow best in the dark rich soil of the temperate climate.

It is much more difficult to get the sugar from beets than it is from sugar cane. The beets after being dug are carried in wagons to the mill or factory. There they are washed and then crushed. The juice obtained is treated in many different ways. At last it comes out as white sugar which you can hardly tell from cane sugar.

The children of cold climates are, I am sure, most interested in maple sugar. The sap of many trees is sweet to taste, but that of the maple tree is best of all.

In the spring the trees begin to awake from their winter sleep. The sun warms the air; and the warm air sends the sap up again from the roots through the trunk and branches. Soon the buds will swell and the leaves will come out.



HAULING THE SAP.

When the sap first begins to flow up the tree-trunks men go into the woods and bore holes in the trees. Then they drive spouts into the holes. The spouts carry the sap away and let it fall drop by drop into pails which are placed underneath.

When the pails are full they are carried to a

great kettle and the sap is emptied into it. A hot fire is kept up under the kettle and the sap is boiled down until it forms a thick syrup or molasses.

How nice the syrup tastes when it has become thick. When the syrup has boiled enough it is emptied into small dishes. As soon as it is cold we have our cakes of maple sugar. This sugar is better than candy and more healthful.

QUESTIONS.

From what three things is sugar obtained?
What fruits taste sweet? Do these contain sugar?
Is there sugar in honey? Where do the bees get the honey?
What is meant by evaporate? By crystallize?
How is maple sugar made?
Where is sugar cane grown?

WHAT THE COW FURNISHES US.

No other animal is so useful to us as the cow. We ought to be very grateful to our grandfathers who so long ago tamed the wild cattle. If the cattle had not been tamed they would all have been killed. How gentle the cow looks. She is not afraid of us and does not use her horns to hook us.

Let us see what the cow furnishes us. One of the most important things is milk. Milk contains everything which we need to keep us alive and make us grow.

From milk we get butter and cheese. When milk stands for several hours the cream rises to the top and forms a thin layer over the milk. The cream was at first scattered all through the milk in the form of tiny globules.

The cream is skimmed from the surface of the

milk and placed in a churn. There it is tumbled about until the little globules of cream have united to form the solid mass of yellow butter.

Do you know how cheese is made? The milk is first curdled by putting into it some liquid rennet. Rennet is the name given to a preparation made from the inner coating of the calf's stomach. The curd is separated from the watery part of the milk, which is called whey, and then pressed into solid cakes. The curd is then called cheese.

When cattle are killed nearly all the parts are used for some purpose. We eat the meat and think it very good. A part of the meat is eaten fresh, other parts are either preserved by being placed in salt water, called brine, or dried in the open air.

The skin is tanned and made into leather for our shoes. The hair which is taken off the skin is also saved. It is mixed in the mortar with which our houses are plastered. The hair helps to make the mortar stick upon the walls.

The bones are first burned and then ground to a fine powder. Bones contain substances which plants need for food. Where the soil does not contain enough of these substances the bone dust is scattered over it. Thus the plants are made to grow stronger and larger.

Even the hoofs are saved. They are boiled in

water and glue is made from them. The horns are not thrown away but are made into a number of things among the most important of which are combs.

QUESTIONS.

What uses are made of milk?
What other animals beside the cow give milk for our use?
What is curd?
Describe the hoof of the cow.
Tell about some of the different ways by which meat is preserved.
For what is glue used?
Mention some of the different uses of leather.
Why do the cows have horns?

A MOTH.

THE STORY OF THE SILKWORM.

A silkworm is not a real worm, but an insect. True worms remain worms during the whole of their life history. The common earthworm which you see upon the ground after a rain is a real worm.

The life history of an insect is not at all like that of a worm. Each of the eggs of an insect hatches into a little worm-like animal, or caterpillar. After living a number of days the caterpillar changes into a pupa or chrysalis. In this condition it has a hard case and is helpless. Now it undergoes a slow

change and after a time emerges as a perfect insect with wings.

Thus we see that the insect during a part of its life looks like a worm, but during another part like a very different creature.

The hairy little caterpillar which you one day watched crawling over the ground may have been the same insect which, at a later time, as a pretty butterfly, you chased over the meadows.

Have you not seen the prettily marked cases, from one half to three fourths of an inch long, hanging from a board or limb? If you happen to find one at just the right time you will see the insect break the case and come out a perfect moth or butterfly.

In a short time its wings, which were tightly folded in the case, will be expanded, and it will fly away through the air.

This butterfly will lay eggs which will, in time, hatch into other caterpillars. Is not this a strange story?

The silkworm came from China. It has been known there for hundreds and perhaps thousands of years. It is now raised in many parts of the world where the weather is not too cold.

The larva or young insect is a little caterpillar.

FROM EGG TO MOTH.

In the earlier part of its life it is hairy, but as it grows it loses its hair and looks more like a worm. This is the reason it is called the silkworm.

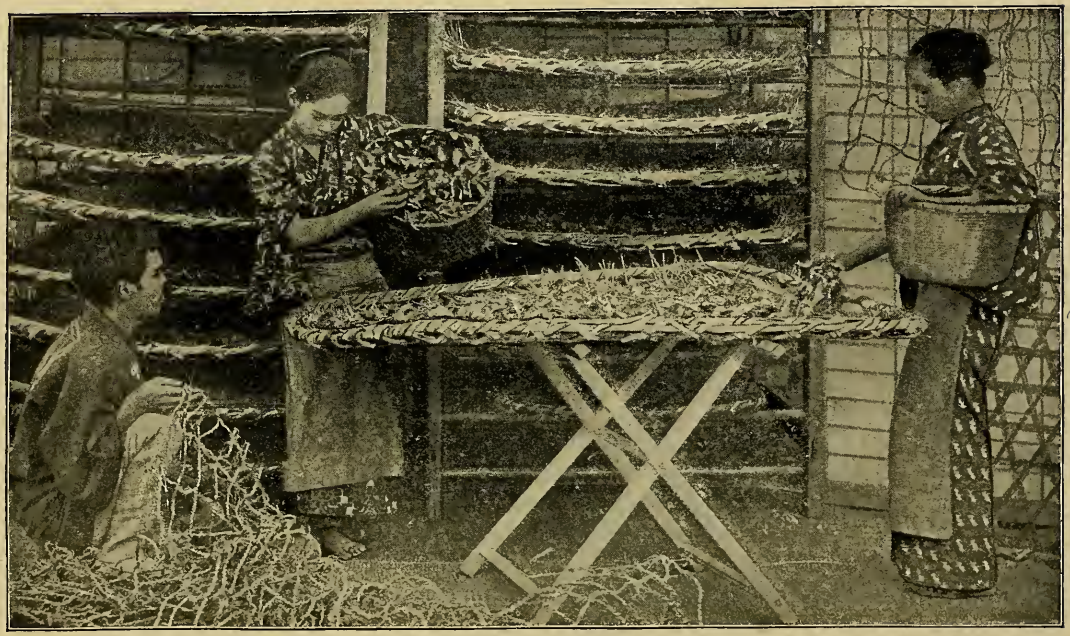
The caterpillars, or larvæ, are given all they can eat of the soft green leaves of the mulberry tree. Where silkworms are raised many such trees have to be cultivated to supply the necessary amount of leaves.

The larvæ are always hungry and very great eaters. During their growth they shed their skins several times. The skin does not grow with the body of the caterpillar, and when it becomes too tight, it cracks and comes off, a new one having formed under it.

When fully grown the caterpillar spins a cocoon of silk about itself, the silk being taken from the lower jaw.

It wraps itself up in about one thousand yards of very fine thread. In this way is formed a whitish or yellowish case which is about one inch in length. In this case, snugly tucked away, the insect goes to sleep, until after having undergone a slow change, he awakes as a moth and bursts the cocoon.

When the cocoons are to be used for their silk, they are not allowed to hatch. At a certain time the insect is killed and the silken threads are unwound. This work is done by the aid of machinery.



FEEDING SILK WORMS IN JAPAN.

You can see that it must take many cocoons to make one yard of silk cloth. The different colors of the silk are given the threads before they are woven into cloth.

QUESTIONS.

How does the silkworm differ from a real worm?
Describe the appearance of a caterpillar.
What is the cocoon? What is the chrysalis?
Mention some real worms.
What is meant by larva? By moth?
Mention a number of insects.
Have you ever seen a butterfly emerge from the chrysalis?
What was it before it became inclosed in the chrysalis?
Mention the uses of the mulbery tree. Does it bear any fruit?
What is the fruit like?
Do all insects fly?
Does the silkworm have wings after emerging from the cocoon?
Where does the most of our silk come from?
Where was silk first made?

THE HOME IN THE DESERT.

My home is in the desert. Did you ever see a desert? I will tell you about it.

The desert is a great valley where it seldom rains. The ground is almost level as far as you can see. Mountains lie all around the valley, but they are ever so far away.

There is little soil in the desert. For miles and miles there is yellow sand and gravel.

In the middle of the desert where the ground is lowest the sand is covered by something white. What can this white substance be? It is not snow, for it is too warm here. If you will taste a little of it you will find that it is soda. Perhaps your mother has used some of the soda from this desert in making bread.

Father helps gather the soda. This is the reason we live in the desert. Father says there was once a time when it rained here. Then there was a lake where the bed of soda is now. The soda was dissolved in the water just as sugar is dissolved in your tea. When the water of the lake dried up the soda was left upon the surface of the desert. The

water went off in the thirsty air, but the soda, like the salt in the ocean, could not escape in this way.

It is very hot upon the desert. We are sorry to see the sun come up and glad when it goes down. Where do you suppose we get our water? We need a great deal to drink for the air is so dry. Men have died upon this desert because they could not find water.

Our water comes in an iron pipe. If you will follow the pipe for many miles over the hot sand you will at last come to the mountains. There in a cañon hidden from the hot sun is a little spring of pure water.

How the wind does blow sometimes! The air is then so full of dust that we can hardly breathe. It is not safe to go far from the house when a dust storm is raging.

It is very lonesome here. There are no trees. There are no flowers and green grass to tell us when spring comes. There is nothing growing in the sand but a few low bushes. These are called greasewood. In some places there are bunches of cactuses. This is a queer plant. It has thick stems and long hooked thorns. We keep as far away from it as we can.

There are no song birds here. The most common bird is the road-runner. He is a strange fellow.

He has long legs and tail, and runs swiftly over the desert.

There are only a few animals. Of course we have mice. Besides these there are the lizards and horned toads. The lizards dart over the sand and are out of sight almost before we can get a look at them. They appear to guide themselves by their long tails. The toads have little horns upon their heads. When it is cold they bury themselves in the sand. The warmer it becomes during the long days the more they seem to like it. They are just the color of the sand.

The rattlesnakes we are afraid of. They are not large, but very quick and poisonous.

THE HOME BY THE OCEAN.

Would you like to know about my home by the ocean? We live in a very pleasant place. We never get tired of playing upon the beach and watching the ships sail by.

When a ship first comes in sight we can see only the tops of the sails. These grow larger and larger and at last the whole of the boat comes in sight. If we climb to the top of a hill we can see the boat much sooner. Our teacher says that we see the tops of the boats first because the earth is round.

Some of the ships come from the other side of the world, for the fishermen once took us out to one and the captain let us see the sugar and oranges and bananas which he had brought thousands of miles.

The water in the ocean behaves very strangely. It is always moving up or down. Twice every day it rises and sometimes we are afraid that it will flow over the land where our home is. But it always stops and then goes down again.

This rising and falling of the water the fishermen call the tide. When the tide is out it is great fun to climb over the rocks and see what the water has left. There are little ponds where we find strange-looking fish, bright-colored sea-weeds, shells, star-fish, and many other things.

In some places there are great stretches of mud flats when the tide is out. There we find different kinds of clams buried in the mud.

When the wind blows hard there are great waves. They break with such force upon the shore that even the hard rocks are worn away. They are slowly tearing down the bank in front of our home. Once a ship was blown ashore and the waves soon broke it to pieces.

There are many pretty pebbles upon the beach. They have been worn smooth by the waves which are always throwing them about.

We wonder if there are hills and valleys beneath the ocean as there are on the land. The fishermen say that in most places the bottom of the ocean is smooth. There are no brooks and rivers in the ocean to dig out valleys as there are on the land.

We have learned that the shore of the ocean has not always been where it is now. At the foot of the hill back of our home there is a layer of shells like those in the ocean, and a whole field of smooth pebbles.

We love to study geography because we have discovered so many things along the ocean that we have read about.

THE TIDES.

"As once I played beside the sea,
Its waters gently came to me,
To bring me sea-weed, stones, and shells
And wash the sand where I dig wells.
But when I went another day,
The waters slowly flowed away,
To gather shells and pebbles more
For me to play with, on the shore."

WHERE GO THE BOATS.

Dark brown is the river,
  Golden is the sand,
It flows along forever,
  With trees on either hand.

Green leaves a-floating,
  Castles of the foam,
Boats of mine a-boating —
  Where will all come home?

On goes the river
  And out past the mill,
Away down the valley,
  Away down the hill.

Away down the river,
  A hundred miles or more,
Other little children
  Shall bring my boats ashore.

— *Stevenson*

A PICTURE.

WHAT IS A MAP?

We have before us a picture of a rocky coast. The picture shows what we would see if we visited the place. Can you mention the different forms of land and water in the picture?

In the front of the picture there is a high, rocky point with trees upon it. Behind the point and partly hidden you can see a deep bay. The ocean waves have torn away the land behind the point and are still making the bay larger.

Upon the farther side of the entrance to the bay is another rocky point. Between the two points there are two low rocky islands over which the waves dash.

In the back part of the picture there are hills. There seems to be an opening between the hills where there must be a valley with a river flowing through it to the ocean.

Our picture is taken from the top of a hill. You could not see so much if you were down near the level of the water. If we were still higher in the air we could see more of the bay and get a glimpse of the river. Such a view we might call a bird's eye view, because it is what we could see if we were up where the birds go.

If we could go up very high in a balloon and look directly down upon the country shown in the picture it would look quite different still. Then if we took a pencil and tried to make a picture of what we saw we should draw the coast line with its bendings in and out, the bays and rocky points, islands, and the river flowing to the ocean. Our picture shows that the different portions of the land vary in height, but far up in a balloon we could not distinguish the height of things. All that we could make out clearly would be their outlines.

Now the drawing which we make of the different forms of the land and water which we can see looking directly down upon them is called a map. Our drawing or map represents the earth as though it were flat. We cannot tell how high the hills or

the cliffs along the ocean are. We can tell, however, that in one place the land is smooth and in another rough. We can put upon our map then some shading to indicate where the rough, hilly places are.

We could not make a map exactly correct while in a balloon. To make a correct map we would need to take a measuring line and compass, and walk all over the country of which we wanted to make a map. We would measure the position and direction from each other of the points, the islands, the bay and the river.

You cannot make a map as large as the country

over which you would walk. What is to be done? You might take one inch upon your ruler and let it represent one hundred feet of distance upon the land. Then if the two points at the entrance of the bay are five hundred feet apart you will lay off five inches upon your paper.

Maps are of much use to us. They represent different portions of the earth's surface. We can look upon a map and tell what there is in a certain place without having to go to that place.

LIBRARY OF CONGRESS
0 021 650 974 2